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A splendid stand of primeval white pine on rocky non-agricultural land near Hibbing. Illustrates a leading principle of forestry, namely, that land unfit for agriculture can yield a handsome and sustained revenue if devoted to forest. In the present ways of



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·FOREST PRESERVATION

FOURTH ANNUAL REPORT

OF THE

CHIEF FIRE WARDEN

OF

MINNESOTA

UNDER THE ACT OF THE LEGISLATURE ENTITLED
"AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE
AND FOR THE PREVENTION AND SUPPRESSION OF FOREST AND
PRAIRIE FIRES," APPROVED APRIL 18, 1895.

FOR THE YEAR 1898.

ST. PAUL, MINN.:
PRINTED BY THE PIONEER PRESS COMPANY.
1899.

STATE OF MINNESOTA,
OFFICE OF CHIEF FIRE WARDEN, }
ST. PAUL, April 20, 1899.

Hon. R. C. Dunn, State Auditor and Forest Commissioner:

SIR: As required by section 3 of the Act for the Preservation of Forests, etc., approved April 18, 1895, I have the honor to submit, herewith, my annual report for the year 1898.

Very respectfully,

C. C. ANDREWS,

Chief Fire Warden.

FOURTH ANNUAL REPORT
OF THE
CHIEF FIRE WARDEN
OF MINNESOTA

The most notable thing in respect to forest fires in Minnesota in 1898 was the fact that although there were a few weeks of dry and dangerous weather in the northern part of the state, both in the spring and autumn, our state escaped any very serious fires, while in the adjoining state of Wisconsin forest fires occurred in the fall, of magnitude to be heralded as a calamity. The forest fires in Wisconsin, the million-dollar forest fire in Michigan in 1896, and the extensive fires in South Dakota, will impress a candid person of the value of even the little preventive means used in this state.

The discussion of the Minnesota fire warden system that took place in the legislature that has just adjourned attracted general attention and no doubt resulted in good. It was urged by some that it would be preferable to have county commissioners appoint fire wardens for their respective counties, and that a supervising state officer at the capital to enforce the law is unnecessary. Certainly if county commissioners would appoint fire wardens who

would attend to their duties, it would be much better than having no such officers. But such fire wardens would need to be paid, and if the state is to bear a part of the expense, as is now the case, there would need to be a state officer to see that the money was properly expended. To whom would such fire wardens make their reports of fires, and from whom receive instructions, if there were no supervising county or state officer? Who would determine when help should be furnished from adjoining districts? It is probable that such a system would be more expensive and less efficient than the present one.

The argument that there is no need of a chief or supervising officer to administer the fire warden law is particularly unsound. Everyone will admit that military companies and regiments are organized in a way that will best promote efficiency. The men are generally of a character to perform their duties with alacrity and self-sacrifice; and yet each company of less than a hundred men, and when in the field averaging probably less than sixty men, is provided with a captain and two lieutenants to maintain efficiency and see that they do their duty. And that a regiment shall be efficient it is provided with a colonel and two or three other field officers. How, then, can anyone say it is a needless expense to have an officer to overlook and direct several hundred local fire wardens? The duty of the principal officer in the fire warden system is to keep the local fire wardens instructed and on the alert in respect to their duties, so that they will warn careless people against causing fires, and in dangerous weather act with promptitude in extinguishing fires, and promptly report in regard to them. In short, the duties and authority of the Chief Fire Warden are to

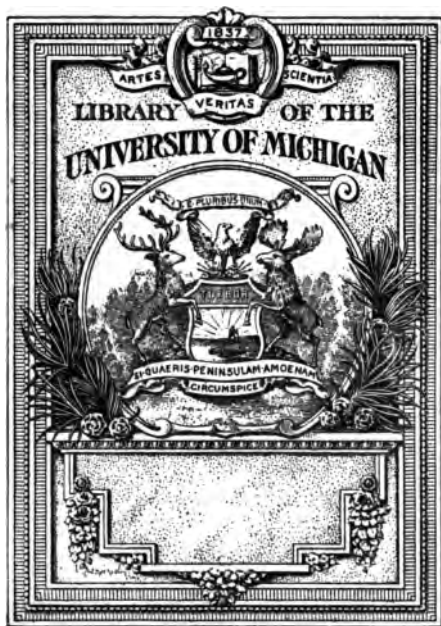
Enforce the fire warden law;

Divide into fire districts unorganized territory;

Appoint fire wardens in or near unorganized territory;

- Have general charge of fire warden force in the state ;
- To mass the fire warden force at any point ;
- Appoint temporarily fire wardens ;
- Coöperate with police or military force of the United States ;
- Furnish warning notices to fire wardens and railroad companies ;
- Instruct fire wardens as to their duties ;
- Require reports from fire wardens ;
- Investigate, and include in ANNUAL REPORT, information as to
 - Extent of the forests in the state ;
 - Amounts and varieties of wood and timber growing therein ;
 - Damages done by forest fires, and causes of such fires ;
 - Method used to promote regrowth of timber ;
 - And any other important facts relating to forest interests.

Our Minnesota fire warden law is substantially the same as has been in successful operation in the forest regions of New York for fourteen years; and the same as has been in operation in Maine and New Hampshire for nearly ten years. It is not a perfect law, but can anyone suggest a better system at a moderate expense? The three town supervisors in each organized town ought to be, and generally are, respectable citizens. They live at different points in their townships, and in attending to their official duties are traveling frequently through their towns. Who better than they could warn any carelessly inclined person in a dry season to be careful about fires? Who better than they would be likely to know of any heedless settler who



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fatally burned a woman who was trying to save a team, and severely burned a boy who tried to protect her. Under our fire warden law, which punishes people for carelessness in causing forest and prairie fires which injure or endanger others, the chairman of the town board, acting as fire warden, had the offender arrested, and he was made to pay a fine of \$100 and costs. There were several other vigorous and effective prosecutions.

FOREST FIRES, 1898.

Reports from fire wardens, made to the Chief Fire Warden, of forest fires in 1898, show that there were fifty-one such fires, and which burned over 21,580 acres, much of which was light timber or cut-over land. Total damage reported, \$9,063, which seems very small, and is accounted for in part by some damaged timber being cut the following winter. Forty of these fires, or 78 per cent of the whole number, were extinguished or controlled by fire wardens and their helpers.

SUMMARY OF FOREST FIRES, 1898.

COUNTY AND TOWNS.	Date.	Acres.	Dam'ge	Cause.	Controlled or Extinguished by Fire Warden or Helper.
Becker County—					
Green Valley.....	April 14	50	\$40	Unknown	Yes.
Green Valley.....	April 18	60	20	Unknown	Yes.
Height of Land.....	May 15	2,000	2,000	Unknown	Yes.
Runeberg.....	May 20	.....	100	Unknown	Yes.
Beltrami County—					
Bear Creek.....	May 17	960	40	Burning meadow...	Yes.
Buena Vista.....	May 28	400	1,000	Hunt'rs or camp'rs	Yes.
Leon.....	May 10	200	.....	Camp fire.	
Leon.....	May 15	400	100	Burning brush.	
Moose Creek.....	May 12	1,000	None	Burning brush.	
Township 148-32.....	May 16	300	200	Campers	Yes.
Township 143-36.....	May 17	50	50	Campers	Yes.
Township 145-37.....	May 16	160	.....	Campers	Yes.
Township 146-37.....	May 14	8,320	848	Unknown.	
Shevlin.....	May 15	400	200	Unknown.	
Benton County—					
Maywood.....	May 8	40	1,000	Burning brush.....	Yes.
Cook County—					
Township 61-1.....	May 16	80	250	Unknown.	Yes.

SUMMARY OF FOREST FIRES—*Continued.*

COUNTY AND TOWNS.	Date.	Acres.	Dam'ge	Cause.	Controlled or Extinguished by Fire Warden or Helper.
Crow Wing County—					
St. Mathias.....	April 10	640	None	Unknown.	Yes.
Township 136-29.....	May 14	30	None	Unknown.	
Crow Wing.....	May 2	640	100	Unknown.	Yes.
Township 136-39.....	May 16	100	150	Unknown.	Yes.
Township 138-27.....	May 6	3,600	500	Burning brush.....	Yes.
Township 135-28.....	May 14	300	100	Campers.....	Yes.
Douglas County—					
Carlos.....	April 26	300	150	Unknown.....	Yes.
Hubbard County—					
Crow Wing Lake...	May 15	3,000	200	River drivers.....	Yes.
Henrietta.....	April 24	1,000	100	Burning brush.	
Henrietta.....	April 29	50	.....	Unknown.....	Yes.
Lake Emma.....	May 14	1,000	40	Unknown.....	Yes.
Lake Emma.....	May 16	80	30	Unknown.....	Yes.
White Oak.....	May 29	1,200	100	Unknown.....	Yes.
Isanti County—					
Stanford.....	May 5	50	20	Clearing land.....	Yes.
Itasca County—					
Deer River.....	April 20	500	1,200	Logging loc'motive	Yes.
Township 60-22.....	June 28	50	150	Unknown.....	Yes.
Township 152-26.....	May 10	40	200	Hunters.....	Yes.
Kanabec County—					
Knife Lake.....	May 12	350	50	Unknown.....	Yes.
Lake County—					
Two Harbors.....	May 10	.....	2,000	Clearing land.....	Yes.
Marshall County—					
Nilson Park.....	May 3	600	50	Campers.....	Yes.
Nilson Park.....	May 16	1,000	30	Unknown.....	Yes.
Mille Lacs County—					
Robbins.....	May 17	40	30	Unknown.....	Yes.
South Harbor.....	May 9	300	300	Indian campers.....	Yes.
Morrison County—					
Clough.....	May 9	300	200	Unknown.....	Yes.
Otter Tail County—					
Oak Valley.....	April 24	20	75	Clearing land.	
Rush Lake.....	May 19	300	300	Unknown.....	Yes.
Pine County—					
Brook Park.....	April 22	100	.....	Clearing land.	
Brook Park.....	April 29	300	50	Clearing land.	
Hinckley.....	May 7	125	65	R. R. locomotive...	Yes.
Finlayson.....	May 14	5,000	2,000	Unknown.....	Yes.
St. Louis County—					
Dinham.....	April 27	10	15	Unknown.....	Yes.
Dinham.....	May 15	640	50	Unknown.	
Kelsey.....	May 17	160	None	Burning fire break.	Yes.
McDavitt.....	May 26	20	None	Unknown.	
Todd County—					
Staples.....	May 5	160	.....	Burning meadow...	Yes.
Villard.....	May 15	1,200	75	Unknown.....	Yes.

Total acres burned over, 21,580. Damage, \$9,063.

Classification of causes:

From clearing land, 5.

From burning brush and meadow, 6.

From camp fires and hunters, 9.

From logging locomotive, 1.

From railroad locomotive, 1.

From other causes, 2.

Unknown, 27.

Total number of fires, 51; 78 per cent controlled or extinguished by fire warden.

REPORTS OF FIRE WARDENS OF FOREST FIRES IN 1898.

BECKER COUNTY.

Andrew Bjorkkel, chairman of the town of Green Valley, May 4th:

April 18th, a fire, which originated on sections 17 and 19, burned over 60 acres of brush and timber and destroyed 5,000 feet of white pine timber. It was extinguished in eight hours after it started by ditching, etc.

May 24th he reports that on the 14th of April a fire on section 27 burned over 50 acres of brush and heavy timber and destroyed 10,000 feet of white pine timber; was extinguished by another person and himself in six hours after it started by ditching.

Albert Wothe, chairman of the town of Height of Land, June 27th:

May 15th, a fire, which originated from cause unknown, on section 8, burned over 2,000 acres of heavy timber. Damage \$5,000. Weather dry and windy. Twenty-two persons were called to help extinguish it with team and plows, hoes and shovels until the rain came and helped put it out. [A subsequent careful examination resulted in placing the damage at \$2,000.]

Frank W. Lindeen, of the town of Runeberg, December 30th:

About the 20th of May a fire was set on section 16, wind being strong, and burned timber of the value of \$100.

BENTON COUNTY.

Jerry Keefe, chairman of the town of Maywood, May 12th:

A fire occurred on section 19, on the 8th of May, and burned over 40 acres of timber and field. It originated on land occupied by S. S. Davis, and was caused by burning brush. It destroyed 500 cords of maple wood belonging to Mr. Robbins of Willmar, of the value of \$1,000. The weather was very dry. Five persons were called to help extinguish the fire, which was done by the use of water and teams. We hauled away wood and made an open space between the wood belonging to Robbins and about 2,000 cords of wood belonging to other parties and which we saved. J. P. Hurt and Robert Rucker rendered praiseworthy service.



White pines left from a clearing, showing appearance of the trees grown in close stand. In Carlton County; Fosston extension railroad in course of construction. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

BELTRAMI COUNTY.

J. W. Speelman, of Buena Vista, May 16th:

A forest fire occurred in the south part of town 148, range 33, May 28th, and burned over 400 acres of light timber; damage, about \$1,000; caused by hunters or campers. Extinguished by rain and backfiring.

Michael Spain, chairman of the town of Moose Creek, May 18th:

A fire occurred the 12th instant, originating on section 3, and burned over 1,000 acres of pine cuttings; no damage. Weather very dry. Fifteen persons assisted in extinguishing the fire. It was extinguished by rain on the night of the 17th instant.

Charles Fleischman, of Buena Vista, May 17th:

There was a forest fire on section 5, town 148, range 32, and on sections 32 and 33 of town 149, range 32. It started alongside of the roadway about 10 o'clock, Monday, May 16th; I put it out as much as I could that afternoon, with the help of another man, and the balance that night. Two claim holders' shanties were in danger of being burned. We had to build counter fires to get up to it. It burned over about 300 acres of standing hard wood, pine and balsam timber. There is more fire south of here, where I will go to-day to see. There are very many men running through the woods looking for land, and the season so far has been very dry, no rain for a month.

Michael Kelly, of Red Lake, June 1st:

The fires we have had so far this spring have done no damage that I can see. So far the weather has been so cold that fires did not run very strong, although there were a great many of them scattered through the country. They are all out now. Most of the fires come from men tramping the country, camping out, building fires and letting them get away from them; and this country is full of such tramps.

Charles E. Scott, of Park Rapids, May 18th:

A forest fire occurred May 17th on section 13, town 143, range 36 (Itasca State Park), and burned over brush and timber. Weather dry and windy until evening, when there was rain. I was called on by the Superintendent of the State Park. Fire was extinguished by digging earth and putting on it, and we got it all out with the help of a good heavy rain on the 18th about 2 o'clock in the afternoon.

Adolf F. Johanson, of Moose, June 8th:

May 16th a fire originating on section 1 of town 145, range 37, burned over 160 acres of brush and meadow; it did no damage of any amount; was extinguished by backfiring in some places, and in other places it went out itself. Weather warm, dry and windy. Has been a big fire in the pine woods in town 146, range 37.

Ole J. Shinn, of the town of Bear Creek (145, range 36), June 10th:

May 17th and 18th a fire which originated on section 2, from settlers burning meadow, burned over about 960 acres of light poplar and destroyed one claim shanty; damage, \$40. Nine persons were called to help extinguish

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the fire, which was done by backfiring and using wet sacks. Fire Warden Ole J. Almquist was present and assisted in controlling and extinguishing the fire. Weather dry and warm.

O. A. Nerhus, chairman of the town of Leon, June 12th:

On the 10th of May a fire on section 7 (northwest part of town) burned over 200 acres of brush and meadow, but did scarcely any damage. It started from a camp fire and was extinguished by a road running north and south, the wind being from the west. Weather clear and quite windy.

A fire on section 15, cause unknown, was extinguished two hours after it started by myself, James Ellis, S. Tisdall and Peter Fosberg; it did no damage.

In my town fire has been very limited; no damage has been done except the burning of some hay and two stables which were settled for.

H. Peck, of town 147, range 36, July 10th:

A brush fire May 15th burned over 400 acres and destroyed some timber on sections 1 and 2. None were called to help extinguish it. Weather dry and windy.

Adolf F. Johanson, of Moose, December 9th:

A forest fire on the 14th of May burned over 8,320 acres of mostly light timber and did damage to the amount of \$848. It originated on section 2, town 146, range 37, from cause unknown; the weather was dry and windy. The fire was extinguished by rain.

COOK COUNTY.

Frank La Sage, of township 61, range 1 east, May 21st:

A fire occurred on section 4, May 16th, which burned over 80 acres of light timber; damage, \$250. Three persons were called to help extinguish the fire, which was done by backfiring.

Gust L. Peterson, of townships 61 and 62, range 4 west (P. O. Lutsen), October 13th:

There have been only some small fires, which I put out.

CROW WING COUNTY.

Millard Shannon, chairman of the town of St. Mathias, May 9th:

A fire occurred April 10th on section 25, and burned over 640 acres of brush land; no property destroyed. It was extinguished in seven hours after it started by the good work of several settlers. Weather dry and windy.

T. G. Butler, of township 136, range 29, May 26th:

On the 14th of May a fire which originated on section 10 passed south along Sibley lake to Mayo brook and went out. It was thought to have been caused by some one smoking.

May 16th a fire near Cullen lake in the south part of township 136, range 39, destroyed some standing timber and 100 cords of wood. It was first reported by the conductor of the Brainerd & Northern railroad, about 4 P. M.

The fire was then east of the track and about four miles below Sibley station. The section men were all there. Three persons were called by the section men to help put out the fire. Weather very dry and wind from the east. The damage done by these fires is not very great.

H. G. Butterfield, of Cross Lake, June 16th:

A fire on the 6th of May, which originated on section 26, town 138, range 27, and which was caused by burning brush on a very dry and windy day, burned over 3,600 acres of light timber and meadow, and destroyed a small amount of second growth pine; damage, \$500. Six persons, including myself, assisted in extinguishing the fire by backfiring, using wet sacks attached to a pole, and by plowing a double furrow. I say the fire was extinguished, that is, we succeeded in putting it out so as to protect the best part of the township; but on the northeast the fire was so fierce that it could not be controlled, hence it ran east to Little Pine river, where it stopped for want of combustibles.

Freeman Thorpe, of Hubert, June 27th:

May 14th a fire on section 7 burned over 300 acres of light timber, destroyed the blueberries and considerable hardwood; damage, \$100 (tie stump land). Twelve persons were called to help extinguish the fire, which was done by throwing sand along the line of fire and whipping it with green boughs. After extinguishment two men patrolled the line for two days, and extinguished the fire whenever it started up, which it did many times. The weather was very dry, with considerable wind. All the men called dropped everything and rushed immediately to the fire, and did effective work, carrying out my directions faithfully and intelligently. The fire approached very near to three homesteaders' buildings, but their owners fought the fire along the general line wherever I posted them without question.

James K. Gardner, chairman of the town of Crow Wing, without date (received December 15th):

May 2d a fire burned over 640 acres of partly field, prairie and forest, and destroyed a few second growth of jack pine of no value (?). Cause unknown, and I was unable to find out. The fire was whipped out, fifteen hours after it started, by the help of eight persons.

DOUGLAS COUNTY.

G. A. Anderson, chairman of the town of Carlos, May 2d:

April 26th a fire on section 5 burned over 300 acres of brush and light timber, but did no other damage than destroying some of the young timber. A stormy south wind was blowing. The fire was extinguished in nine hours after it started by four persons making a clean path and setting backfire; and where water was near wet sacks were used.

HUBBARD COUNTY.

Lon Dutton, chairman of the town of Lake Emma, May 19th:

On the 14th instant a fire which originated from cause unknown on section 5, township 141, range 34, burned over three sections of mostly poplar

and some pine, damage possibly \$30 or \$40. It was extinguished by building backfires. Weather very dry and windy. U. G. Kempton, fire warden, first discovered the fire about 11 o'clock Saturday morning; he called some people living in his vicinity to help him. Seven persons assisted in extinguishing the fire, which was accomplished in thirty hours after it started.

May 16th, 9 P. M., a fire in the east part of township 141, range 34, burned over about 80 acres of light timber. It came into our town from the east. Two of the supervisors (fire wardens), U. G. Kempton and D. J. Johnson, were at this fire as soon as they learned of it. It was extinguished by making a backfire between Mud lake and a marsh. Weather very dry and windy.

C. H. Yeager, chairman of the town of Henrietta, May 21st:

A fire, April 24th, which started on section 23 (town 140, range 34), burned over 1,000 acres of mostly prairie and some jack pine. It burned through to the Crow Wing river; there was no use calling any help, for it could only go to the lake and river. I think it was set by men who own land on the same section and who live here. It was set so that it would burn their land over. It destroyed two miles of fence; no other damage. The fence was not much good. The timber that was burned is on land that will be cleared up and farmed soon, for some of it is being cleared and broke now, so the fire did more good than damage, except the fence.

April 29th there was a fire on sections 20 and 21. It was set in five different places, with the intention of burning over about 15 sections of small timber, jack pine and Norway, some poplar. It was set in the thick timber about 3 o'clock in the afternoon, and made slow progress; it burned over about 50 acres, and was put out by rain. About 6 o'clock I was in this locality and saw smoke, and went to see what it meant; the fire was about half an acre in size, so I was going to get help to stop it, but when I got about half a mile I found another fire, so I stopped to look after the men who set it, but I cannot find any positive proof, as there were so many people over the road that afternoon.

J. W. S. Reightly, chairman of the town of Crow Wing Lake, May 30th:

About the middle of this month a forest fire, caused, I think, by river drivers, burned over about the north half of town 140, range 33, burning some of the slashings that were cut last winter. It did not do very much damage so far as I could see. We had a rain ten days ago that put a stop to it. I kept a watch around here and did all that I could to keep fire out of my town; the weather was warm and dry. There are lots of men coming from other places and running all over the country looking for land.

A. O. Paulson, of townships 144 and 145, range 32, Graceland, June 3d:

On the 14th of May, a fire, which originated on section 28 from parties burning meadow in order to obtain more grass for hay, burned over 60 acres of mostly dead and down timber, and destroyed a young growth of pine and poplar. Weather very dry. It was extinguished the evening of May 17th by a heavy shower of rain. At the time the fire started I was away from home, and did not return till the 18th of May. The principal danger of fires up in this region of country is from clearing land. I have talked with quite a num-

ber of settlers and cautioned them to be very careful when clearing their land not to let the fire get away; and I think the best way of lessening it would be to have a man do nothing else in the day time but watch those places.

John F. Nichols, chairman of the town of White Oak, November 7th:

A forest fire, May 29th, in the northeast part of the town burned over about 1,200 acres of light timber and destroyed a small amount of green timber; it originated in Cass county, cause unknown; supposed to be from railroad. Weather was dry and windy. I had a half dozen men ready for work when a rain set in and extinguished the flames.

ISANTI COUNTY.

John E. Palm, chairman of the town of Stanford, May 14th:

On the 5th of May a fire burned over 50 acres of light timber and destroyed the new grass for pasturing; damage, \$20. It originated on section 4, where there had been burning a clearing the day before. It was started the next morning by a heavy wind. It was extinguished by team and plow and by the use of wet mops. I was assisted by Victor Palm. The weather was dry with a northeasterly high wind.

ITASCA COUNTY.

James Woolford, of the town of Deer River, June 27th:

April 20th a fire which originated on section 36, town 146, range 25, and caused by a locomotive on the Itasca logging road, burned over 500 acres of partly heavy pine and partly swamp; damage to timber, \$1,200. The fire was put out with water and wet sacks and by pounding the fire. Eight persons assisted. I was the only fire warden present. The weather was dry and windy.

August Amell, of Bridgie, October 7th:

On the 10th of May, a fire caused by hunters camped on section 26, township 152, range 26, burned over 40 acres of light timber; damage, \$200. Weather very dry. The fire was extinguished ten hours after it started by shoveling up the soil and scraping up the leaves and rubbish around the fire. I extinguished it myself.

Edward Spring, of unorganized township 60, range 22, November 12th:

On the 28th of June, a fire on section 21, burned over 50 acres of brush and light timber and destroyed jack pine, birch and spruce; damage, \$100 to \$150. Three persons assisted in extinguishing the fire, which was done by backfiring and trenching.

KANABEC COUNTY.

E. O. Mellgren, chairman of the town of Knife Lake, July 11th:

On the 12th of May, a fire which originated on section 24 from cause unknown, burned over 350 acres of brush and meadow land; damage, \$50. Weather dry and windy. The fire was extinguished 15 hours after it started by the help of J. O. Thelander, fire warden, and nine others.

LAKE COUNTY.

Thos. Owens, Supt. Duluth & Iron Range Railroad Co., Two Harbors, May 9th, (telegram):

Weather clear, dry, high wind; fire started Friday last three miles west of track. Nothing serious.

Same, May 9th, 4:18 P. M. (telegram): Town 53 still burning, but under control; no villages in danger.

Same, May 10th (telegram), 8:30 A. M.: Fire in town 53, range 10, destroyed about one million feet of logs banked on lake four miles east of here; fire tugs were used; fire now quenched; logs owned by Richardson & Avery.

Same, May 11th: Referring to your letter of 9th inst., I should have stated in my telegram, town 53, range 11, and in section 33, which is about three miles away from our road. There are quite a number of settlers locating in this vicinity, and a large number of these fires start on account of the work which they are doing towards clearing their land. The fire referred to was controlled by the men in our employ, but was easy to control, as it burned to the track.

Same, May 13th: Replying to your letter of 10th instant in regard to the origin of the fire which burned the logs on Flood bay, beg to say that there are several farmers located in section 29-53-10, Lake county, and, while it is not definitely known, it is generally supposed that by their doing some clearing the fire ran to the pile of logs.

James H. Lunz, president of the village council of Two Harbors, May 10th:

Replying to yours of the 9th, will say, we have some heavy forest fires raging both west and north of here, about three miles distant, but they are on land from which the pine timber has been cut. The only damage so far was on the night of the 9th instant, three miles north of here; it burned about 300,000 feet of logs banked at the mouth of Stewart river on Lake Superior; logs got out by Scott & Halston's company for Richardson & Avery. We gave them all the aid we could to fight the fire. It is, in my opinion, impossible to fight fire in an old slashing.

Same, May 14th: Replying to yours of the 12th, will say, the fires in this vicinity were in 53-11 and 54-10. The logs were burned in town 54-10. The fires at this time, as far as I know, are all out. The chairman of the town board of Two Harbors was at the fires.

W. D. Lawrence, chairman of the town of Two Harbors (by telegram), May 12th:

We are doing all that is possible towards extinguishing fires.

Same, May 14th: On the 8th instant a fire in old slashings, which as near as I can learn started along the county road, burned over four acres of brush and destroyed about 300,000 feet of logs. Twenty-five persons were called and helped extinguish the fire. One tug was furnished by the Duluth & Iron Range Railway Company and one fire tug from Duluth. Hose was furnished by the village of Two Harbors. The logs were owned by Richardson & Avery, and were about three miles from town. Weather very dry and calm.



Norway pine forest on soil only about eight inches in depth lying upon a granite ledge; property of the State University and situated on north shore of Vermillion Lake. Treated on forestry principles the land would yield a sustained revenue, but if the pine be cut in the present usual manner the soil will gradually be washed away and nothing be left but bare rock. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Waste land, in Beltrami County. There is a large amount of such land in Northern Minnesota which is now of no benefit to anyone. It would, however, bear pine forest, and if managed on forestry principles, it would earn and yield a fair net revenue and at the same time make the country look handsomer. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

W. D. Lawrence and James H. Lunz, fire wardens, were present; Richardson was there himself, also three members of the fire department of the village of Two Harbors.

MARSHALL COUNTY.

N. C. Rood, chairman of the town of Nilson Park, May 19th:

A fire May 3d, which started on section 3 and caused, as I am informed, by land hunters, burned over 600 acres of brush, meadow and prairie; destroyed nothing but a couple of cords of poplar wood. It was extinguished by myself with the help of six other persons by backfiring and using wet sacks. Weather very windy. We saved several hundred dollars worth of property by being there so soon after the fire started.

Same, May 28th: A forest and prairie fire originating on section 36 occurred May 16th and 17th, burning over 1,000 acres of brush and poplar and which destroyed some cord wood; damage, \$30. Weather quite dry and windy. Eight persons were called and helped extinguish the fire, which was done with use of water and sacks, also some backfiring.

MILLE LACS COUNTY.

W. H. Evans, of the town of Robbins, October 30th:

Last spring we had a forest fire here which for a time threatened to be quite serious, but by hard work all night long we got it under control and extinguished it. I had six men out on duty.

J. L. McQueen, chairman of the town of South Harbor, December 21st.

On the 9th of May a fire supposed to have been set by Indians, burned over 300 acres on sections 20, 28 and 29 and destroyed timber of the value of \$300. The fire was extinguished four days after it started by carrying water in pails and by beating the ground and with the use of wet sacks.

MORRISON COUNTY.

E. S. Hall, chairman of the town of Clough, May 12th:

The 9th instant a forest fire on section 29 burned over 300 acres of light timber and destroyed some young pine and other young timber; damage, \$200. I do not know how it originated. Ten persons were called to help extinguish it, which was done with water and by throwing dirt upon it. Weather very dry and windy.

OTTER TAIL COUNTY.

Frank Brauch, chairman of the town of Oak Valley, May 17th:

A forest and prairie fire April 24th, caused by clearing land the day before and where the fire was supposed to have been put out, burned over 20 acres and destroyed a stack of hay, two calves and a kit of carpenter's tools; damage, \$75. Three persons saved the house. Weather windy. The fire was extinguished by a good rain.

John F. Doll, chairman of the town of Rush Lake, June 8th:

May 19th a fire on section 15 burned over 300 acres of heavy timber, and did damage to the amount of \$300. I was assisted in putting out the fire by the help of four persons, which was done by plowing and backfiring. Weather clear and windy.

PINE COUNTY.

A. B. Ziegler, chairman of the town of Brook Park, May 10th:

April 22d a fire in the northwest part of the town burned over 100 acres of dead timber and heavy weeds where logging was done last winter. It did no damage. It was extinguished by backfiring and using wet sacks. The weather was and is yet very dry. The timber being dead, every one seems to think it is a good thing to burn the marshes and swamps.

On the 29th of April a fire on section 30, in the southwest part of the town, burned over 300 acres of partly dead and partly green timber. It is hard to tell the cause of the fire, as every settler is clearing his meadow; besides there are some Indians shooting about the woods all the year round. Yesterday there was a fire again in the southeast part of the town; I have asked some of the settlers if the fire was doing any damage, and they said no.

A. D. Leonard, chairman of the town of Hinckley, May 14th:

On the 7th of May a fire on section 34, caused by the Great Northern passenger train, burned over 125 acres tamarack and brush; destroyed 37 cords of tamarack wood; damage, \$65.60. Weather clear and windy—wind from south. It had been very dry all spring, only one little rain, which occurred one week previous to the fire, and which dried up very quick.

W. G. Sawyer, fire warden, Partridge, May 14th (telegram):

Serious forest fires raging, and they are beyond control. Town not threatened as yet. Answer.

Same, and operator May 14th (telegram), 9 P. M.:

Fire originated about six miles east; still running; cannot say how extensive. Burned until within a mile of town, and people backfired. No danger far as town is concerned unless heavy wind. No help needed at present.

J. A. Oldenburg, chairman of the town of Finlayson, May 14th:

Your message reached me to-night and I at once began to order out men to proceed to Partridge as per your instructions. One-half hour after receiving your message Mr. Sawyer wired me as follows: "We do not need help to quench fire," whereupon I stopped getting men and sent those I had collected to their respective homes.

W. G. Sawyer, of Partridge, May 16th:

Referring to my telegram of Saturday, will say that I wired you that the town was not in danger and so did not expect any help, but I telegraphed Sandstone, Finlayson and Rutledge not to send anyone, so no expense was incurred by my having wired you. The worst of the trouble is over, but most of the country has been burned over. I fought fire here two days with eight men, and will see you in a few days relative to the expense.

[In a subsequent conversation Mr. Sawyer expressed the opinion that the fire was caused by children who had been fishing.]

John A. Oldenburg, chairman of the town of Finlayson, May 20th [referring to above mentioned fire]:

A fire of May 8th burned over 5,000 acres of heavy and light timber and destroyed 2,000 acres of timber. I could not ascertain its origin, nobody seemed to know it. Eleven persons, including W. G. Sawyer, fire warden, assisted in controlling the fire, which was finally extinguished by rain.

G. T. Slade, Supt. Eastern Minnesota R'y Co., West Superior, May 17th (telegram):

Have been doing what I can to extinguish forest fires and will continue to watch and extinguish them.

ROSEAU COUNTY.

Telegraph operator, Stephen, Minn., May 16th (telegram):

No report from Roseau county about forest fire. As near as I can learn from stage driver, fire does not amount to much.

ST. LOUIS COUNTY.

President village council of Hibbing, May 10th:

Sunday last there was a small fire about two miles south of the village, but it burned itself out about. It is not quite dry enough for fire to travel much. We have some bad forest slashings in village limits.

J. W. Power, Hibbing, May 11th:

As attorney for the village I have been instructed to write you relative to the heavy pine slashings to the north, south and west of the village. I have notified the owners of the property, but in each instance have received no satisfaction, and the council, realizing the danger of the destruction of the village in case these slashings were fired, believe the matter should be taken care of by the State Warden; they have not the means to destroy this nuisance. Some of the slashings are within one mile of the main street, and, the spring so far being very dry, the danger of the fire is greatly increased. There have been 80,000,000 feet of pine cut in this vicinity during the past winter, and you can from that figure get some idea of the enormous amount of slashing there is. To the south of the village there has been a big fire for the last three days, and no rain. Let me hear from you on the subject.

J. W. Kreitter, Supt. Duluth, Missabe & Northern Railroad Co. Duluth, May 10th (telegram):

A few small forest fires along line, but not serious. Weather been very dry.

Same, May 12th: I am in receipt of your letter of May 10th, and in reply would state, that all of our men have instructions that they must positively put out, if it is within their power and force, all forest fires on or near our right of way, and we have never yet had a serious right of way fire. All of our engines receive daily inspection as to their stack netting, and all employes are cautioned two or three times a season about the seriousness of

setting, or allowing to be set, any fires along the line at an unseasonable time. We had a very slight rain yesterday, but the weather continues to keep dry.

No fires on the line to-day.

Henry Kirk, chairman of the town of Duluth, May 12th:

In regard to those fires, I would have written to you before now, but I have been away from home for some time. There is some fire in section 27, town 53, range 12, also in sections 22 and 34, set by men camping out, but the fire has not done much damage yet, as it is in where there was fire four years ago. I did not call out any help, as it looked to me impossible to put the fire out. The weather has been dry and warm for the last three weeks. Cool to-day; no fires burning to any amount.

J. D. Murphy, mayor of Tower, May 11th:

If there are any forest fires between Duluth and Tower I know nothing of it. I have been absent from home for the last week, and to-day have been informed that there are some fires in the forests north and northwest of Tower, and, as my informant put it, some bad fires at that. We are having some rain to-day, which I hope will help put out these fires. If you want me to go and investigate their extent and help to extinguish same, let me hear from you by return mail.

Same, May 13th (telegram): Fires are still smouldering five to fifteen miles from Tower. Nothing serious at present.

Same, May 16th: Sorry to say that since I answered your telegram forest fires have started up all around, so really I do not know which direction to go. There is a saw mill located on the line of the Duluth & Iron Range Railway some fifteen miles south of here (Norway). Word has just reached me this evening that all their sawed lumber was burned to-day; write or wire me at once. Everything is as dry as tinder; the rain we had did not amount to much.

Thos. Owens, Supt. Duluth & Iron Range Railway Co., May 17th (telegram):

The fire at Norway was not caused by forest fires. There are a few small forest fires along road, nothing serious.

Same, May 19th: Answering your letter of the 17th instant in regard to the lumber and mill that were burned at Norway on our line, beg to say that Norway is located in town 60 north, range 15 west, section 10, St. Louis county. We have had a good rain storm, which has greatly reduced the risk.

E. D. Hughes, of Embarrass, May 26th:

Regarding the late fire at Norway (a mile and a half from my office), when owners quit sawing lumber and moved away they left a large pile of sawdust burning close to lumber and no one to watch it. The surrounding country is tamarack, spruce, pine and brush. The day of fire the wind was blowing direct from fire in sawdust towards the lumber, and no doubt was cause of fire in lumber, as there was no forest fire near there. The late rains have extinguished about all the small fires that were around here.

Same, June 15th: The water supply is at mill that was burned down, and will have to be carried about 100 feet. Will start to extinguish the fire to-morrow morning, and will guarantee that the sawdust will be thoroughly

shoveled over and all the fire extinguished. I will personally attend to this matter and see that it is done thoroughly, and that fire is extinguished absolutely.

John McKay, chairman of the town of Floodwood, May 13th:

On the 4th instant a fire burned over 100 acres of brush and light timber on section 6, occupied as the townsite of Floodwood. It took place under the instructions of the board of supervisors and with their assistance, in burning the slashings that had accumulated here for several years, taking three different days to burn, according to the wind. We burned the brush, making our little place here comparatively safe, and did not a cent's worth of damage to any one.

D. R. Murphy, Supt. Duluth, Miss. River & Nor. Railway, Hibbing, May 17th (telegram):

Our men have orders to prevent fire spreading. Occasionally a slashing burning. Standing timber not harmed yet. Weather continues dry.

J. W. Kreitter, Supt. Duluth, Missabe & Northern Railroad Company, Duluth, May 17th (telegram):

Not much fire along our line; few places, but our men keeping track of them. If anything serious will put them in charge of outside persons and send bill of expense. Weather still very dry and no prospects for rain.

D. M. Philbin, General Superintendent Duluth, Superior & Western Railway Company, Duluth, May 17th (telegram):

Some small fires near Grand Rapids, but not close to our tracks. Woods very dry and much danger. Will do everything possible to extinguish and prevent fires.

Clyde Bender, recorder village of Sparta, May 17th:

The village board would respectfully call your attention to the bad condition of lands adjoining this village, which, owing to the fallen timber, etc., on same, is a menace to the village through the liability of fire. Your attention to this is solicited. The country in this vicinity is very dry at present, and, as we have had no rain, there is much danger of destructive forest fires.

William McComber, chairman of the town of Dinham, May 21st:

A fire occurred on section 12, April 27th, which burned over ten acres of field and destroyed 300 feet of fence; damage, \$15. It was extinguished in four hours after it started by carrying water in pails. A heavy southwest wind was blowing.

Edward Hunter, of the town of Dinham, June 27th:

May 15th a fire originating on section 16 burned over 640 acres of partly light timber and destroyed one logging camp; damage, \$50. The weather was hot and dry. No one was called to help extinguish the fire, for there are only two men that live within five miles of me, and they had to watch their property. It was all I could do to save mine. It is not known how the fire originated.

Wesley Mathews, chairman of the town of Kelsey, May 27th:

On the 17th instant a fire in the south part of town 53, range 18, burned over 160 acres or more of cut-over pine land, but destroyed nothing of any value. Parties had cleared up some old logging tops around a county road bridge, and were burning them up to safeguard the bridge, when the fire suddenly got beyond their control. It was extinguished four hours after it started, four persons assisting. It mostly burned itself out. When it got through the old choppings into the green timber it stopped, and, rain coming on that evening, put it out completely. The weather was very dry and hot when the fire started. The fire threatened at one time to burn up a large quantity of logs banked in the small creek, but by heroic efforts on the part of the men who were clearing to save the bridge, no damage was done to the logs.

J. L. Greatsinger, president and general manager Duluth & Iron Range Railway Company, Duluth, September 22d:

Replying to yours of the 21st instant. There are practically no fires on the line of our road this year, and in fact probably less than we have ever known before. It is a great problem as to where all this smoke comes from that is on Lake Superior. It must come from the north, as the prevailing winds have been in that direction, probably from Canada.

P. W. Scott, president of the village council, Virginia, September 2d (telegram):

No danger at present. I am watching closely.

Same, September 21st (telegram): Had a small fire in 59-63, but it is all out. No more danger at present.

J. D. Murphy, mayor of Tower, September 21st (telegram):

No signs of forest fires in this neighborhood.

Dagobert Mayer, chairman of the town of McDavitt, October 15th:

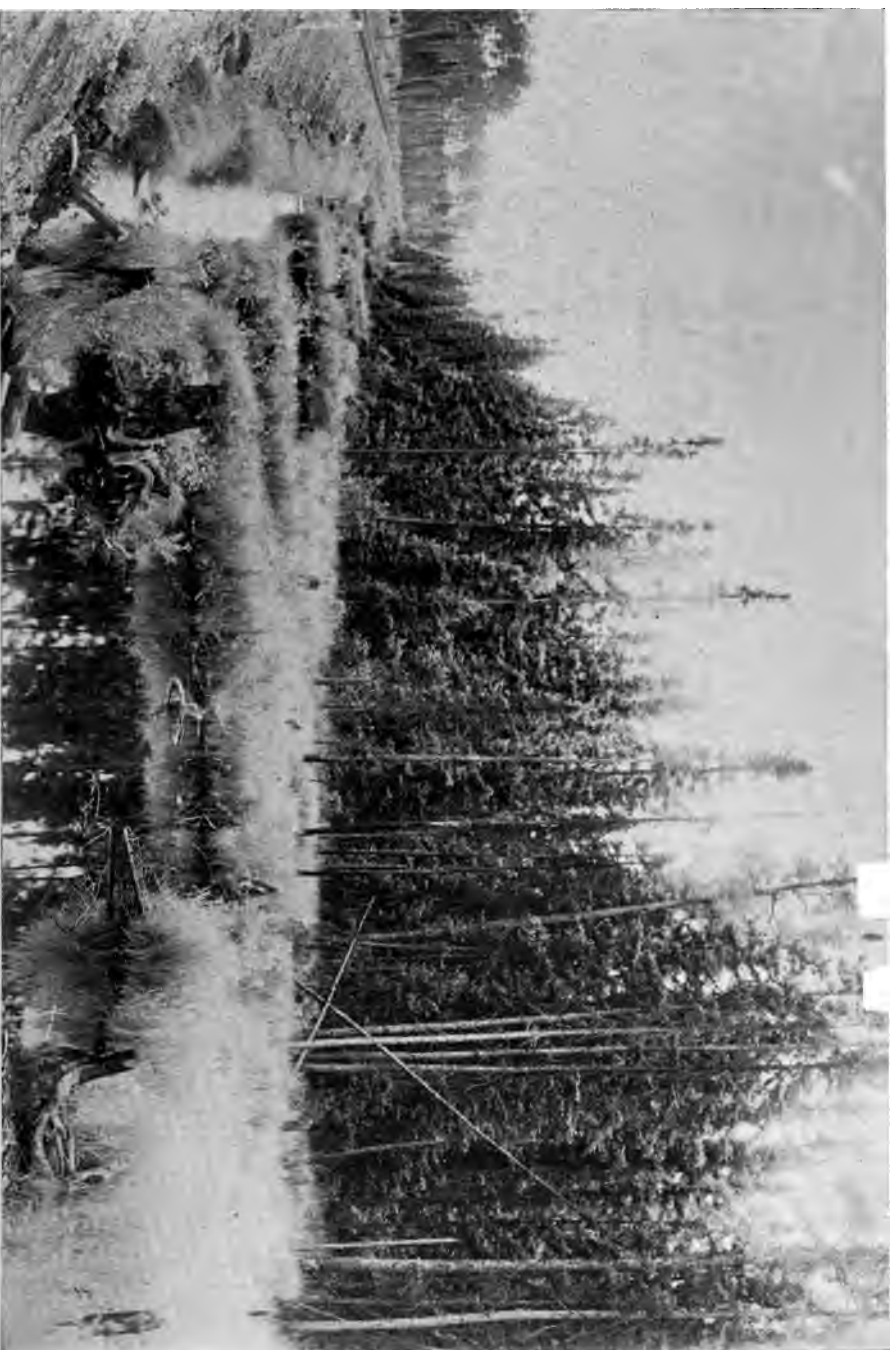
A fire May 26th on section 16 burned over 20 acres of logging slashing. It did not do any damage. Could not find out how it originated. Was extinguished by rain. The weather was dry for three weeks.

TODD COUNTY.

H. C. Miller, chairman of the town of Staples, May 14th:

May 5th a field fire on section 5 burned over 160 acres of marsh. It burned Mary Jane Halliday, aged 72 years, severely; also Luther Hall, aged 23 years. Mr. Hall, father of the boy that was badly burned, states that one Wyman Montgomery set the fire. I understand that he has left the country. Mrs. Halliday died; the boy is in bad shape and his folks very poor. The fire was extinguished eight hours after it started by three persons whipping it with coarse sacks.

Same, May 21st: Replying to yours of the 17th, regarding the field fire, it started on the southwest quarter of section 5. It was set by Mr. Montgomery, the owner of the land, for the purpose of burning the meadow and raspberry bushes. Mr. Joseph Hamberg, a neighbor of Montgomery's, saw him set the fire. Montgomery did not stay to watch the fire, but started for the village of Staples after setting the fire, and did not return to watch it. Mr. Halliday



Spruce forest near Wolf Junction, in St. Louis County, such as is being rapidly consumed in the manufacture of wood pulp; but no steps being taken for regrowth. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

and others were fighting the fire after it had spread onto section 6. Mr. Halliday's team was in the field, and Mrs. Halliday's clothes got on fire as she was trying to save the team. Young Hall had his hands badly burned as he was pulling the burning clothes from Mrs. Halliday. She lived about eight hours after being burned. The fire was set in the forenoon and burned until midnight; the weather was dry. Montgomery has not been seen since the fire; if found he should be arrested and prosecuted.

Same, June 1st: The distance from where the fire started to where it came in contact with Mrs. Halliday is about half a mile; the land is rolling and covered with bushes. I have had a warrant sworn out for the arrest of Montgomery and placed in the hands of the sheriff.

December 2d, Mr. Miller reported that Montgomery, on the 10th of June, plead guilty before a justice of the peace of carelessly setting a fire, and was fined \$100 and costs, which he paid. He states that Montgomery denied setting the fire that caused the death of Mrs. Halliday.

Frank Sears, chairman of the town of Villard, June 8th:

A brush and timber fire, starting from cause unknown, on section 13, May 15th, burned over 1,200 acres of meadow and timber, and destroyed hay of the value of \$50 and fencing of the value of \$25. It was extinguished in 30 hours after it started by plowing and backfiring. Weather hot and windy.

Same, June 12th: It started near an old road where there is a great deal of bicycling. There is a person we think set the fire, but we have no proof. Two families came near being burned out, and they are anxious to know who caused the fire.

SUMMARY OF PRAIRIE FIRES, 1898.

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
Becker County—				
Atlanta.....	Sept. 20.....	300	\$40	Burning straw.
Atlanta.....	Sept. 20.....	450	50	Burning straw.
Big Stone County—				
Tokua.....	Oct. 10... ..	10	200	Unknown.
Clay County—				
Cromwell.....	May 7.....	100	20	Unknown.
Flowing.....	April 1.....	.....	100	Unknown.
Flowing.....	May 9.....	600	36	Unknown.
Flowing.....	Nov. 13.....	600	None	
Georgetown.....	Sept. 18.....	160	200	Burning straw.
Goose Prairie.....	April 10.....	320	200	Burning grass.
Hawley.....	Sept. 17.....	300	100	Railroad locomotive.
Hawley.....	Sept. 18.....	200	275	Railroad locomotive.
Keene.....	April 3.....	4,000	200	Unknown.
Riverton.....	Sept. 18.....	20	50	Railroad locomotive.
Riverton.....	Sept. 19.....	40	10	Railroad locomotive.
Riverton.....	Sept. 20.....	450	600	Railroad locomotive.
Riverton.....	Sept. 21.....	40	10	Railroad locomotive.
Riverton.....	Sept. 27.....	15	375	Railroad locomotive.

SUMMARY OF PRAIRIE FIRES, 1898—*Continued.*

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
Kittson County—				
Deerwood.....	April 26.....	600	300	Unknown.
Deerwood.....	May 5.....	300	50	Unknown.
Poppleton.....	May 2.....	200	None	Unknown.
Poppleton.....	May 20.....	2,000	None	Burning brush.
Skane.....	April 11.....	450	20	Burning grass.
Skane.....	May 6.....	125	40	Burning grass.
Lac qui Parle Co.—				
Freeland	April 2.....	1,200	None	Unknown.
Garfield.....	Oct. 27.....	300	100	Threshing engine.
Lac qui Parle.....	May 1.....	7,000	.....	Hunters.
Manfred.....	April 2.....	6,000	.....	Unknown.
Manfred.....	April 7.....	300	600	Burning grass.
Lincoln County—				
Shaokaton.....	April 11.....	600	500	Burning grass.
Marshall County—				
Comstock.....	April 14.....	200	10	Burning grass.
Comstock.....	April 24.....	300	50	Burning grass.
Grand Plain.....	May 13.....	400	100	Indian reservation.
Stephen.....	April 18.....	160	300	Burning grass.
West Valley.....	Nov. 15.....	60	.....	Unknown.
Murray County—				
Ellsborough.....	April 16.	640	.....	Unknown.
Ellsborough.....	Oct. 28.....	160	70	Burning straw.
Norman County—				
Good Hope.....	Nov. 5.....	3,060	300	Unknown.
Hegne.....	Nov. 3.....	1,240	2,500	Burning straw.
Otter Tail County—				
Carlisle.....	Sept. 21.....	50	180	Railroad locomotive.
Polk County—				
Crookston.....	April.....	20	30	Unknown.
Eden.....	May.....	10	10	Unknown.
Onstad.....	Sept. 20.....	100	200	Railroad locomotive.
Onstad.....	Sept. 27.....	1,900	3,000	Railroad locomotive.
Russia.....	Nov. 2	2,000	550	Railroad section men.
Kertsonville.....	Sept. 27.....	1,300	90	Railroad locomotive.
Vineland.....	Nov. 12.....	400	None	Burning fire breaks.
Red Lake County—				
Bray	April 24.....	200	30	Burning grass.
Emardville.....	May 14.....	200	20	Unknown.
Louisville.....	April 15.....	5,000	.....	Unknown.
Numedal.....	May 8.....	1,000	100	Unknown.
Poplar River.....	April 29.....	100	30	Burning grass.
Sanders.....	Nov. 2.....	300	40	Tobacco pipe.
Redwood County—				
Honner.....	Sept. 3.....	40	15	Railroad locomotive.
Springdale	April 26.....	80	200	Burning straw.
Vail.....	Sept. 19.....	160	6	Burning stubble.
Stevens County—				
Baker.....	Nov. 15.....	300	None	Unknown.
Hodges.....	Sept. 14.....	200	150	Railroad locomotive.
Scott.....	Sept. 17.....	800	250	Burning straw.

SUMMARY OF PRAIRIE FIRES, 1898—*Continued.*

COUNTY AND TOWNS.	Date.	Acres.	Damage.	Cause.
Todd County— Ward.....	April 12.....	600	80	Burning meadow.
Wilkin County— Akron.....	April 15.....	640	15	Burning grass.
Mitchell.....	March 4.....	600	None	Unknown.
Nordick.....	Sept. 3.....	20	None	Burning straw.
Roberts.....	Sept. 27.....	640	240	Unknown.
Yellow Medicine Co— Florida.....	Mch. 30.....	1,280	125	Unknown.
Florida.....	April 7.....	1,500	400	Burning straw.
Florida.....	April 27.....	620	200	From South Dakota.
Florida.....	Sept. 28.....	80	20	Railroad locomotive.
Norman.....	May 5.....	350	Slight	Unknown.

Total acres burned over, 54,360. Damage, \$13,436.

Classification of causes:

Burning grass, straw or stubble, 23.

Railroad locomotives, 14.

Other causes, 5.

Unknown, 25.

REPORTS OF FIRE WARDENS OF PRAIRIE FIRES IN 1898.

BECKER COUNTY.

C. N. Noben, chairman of the town of Atlanta, September 21st:

A prairie fire occurred September 20th on section 26, eastern part of town, and burned over 300 acres of prairie and meadow, damaged 100 acres of hay meadow; damage, \$40. There will not be any hay on the land next year, but of course year after next it will be all right again. The fire was caused by carelessness in burning straw without plowing around it. Fire was extinguished by plowing and fighting with wet sacks. Number assisting, three. The weather was dry, with a high wind from the south. Anton Venner did praiseworthy service with his plow and team at this fire, as he saved a man's hay and barn.

September 20th, a fire on section 22, land occupied by Ole J. Floten, and caused by carelessness in burning straw without plowing around it, burned 450 acres of prairie and meadow, and got into a grove of planted trees; damage, \$50. It was extinguished by two persons with myself by plowing and fighting it with wet sacks; there was a high wind from the south. Hans Eide did good work by plowing enough to save ten acres of trees. The parties who caused both of the fires reported suffered damage to their hay meadows.

BIG STONE COUNTY.

Patrick Cawley, chairman of the town of Tokua, November 28th:

On the 10th of October a field fire on section 25 burned over 10 acres and destroyed one setting of wheat; damage, \$200; cause unknown. It was extinguished by the owners of the property by plowing and using wet sacks. Wind was blowing a gale.

CLAY COUNTY.

P. J. Running, chairman of the town of Keene, April 8th:

On the 3d instant a prairie and stubble fire burned over 4,000 acres in the northwest part of the town, and destroyed grass and damaged grass roots. The fire came from the town of Hagen or farther north, where it had been seen to burn more than 24 hours before it reached this town. It was controlled by setting backfire along roads and using wet sacks, 14 persons helping. April 4th the wind changed to northeast; about 8 o'clock the fire started up again on section 17, and burned over that and into section 19, where three persons put it out with wet sacks along roads and fields and wherever practicable, and by setting backfires.

Peter Grambo, chairman of the town of Flowing, April 30th:

A prairie fire April 1st destroyed 50 tons of hay; cause unknown. The weather was dry and windy. I believe the fire started from a locomotive; I was away about one mile when I saw the fire.

Same, May 10th: A fire on the 9th instant burned over 600 acres of prairie and destroyed 12 tons of hay; damage, \$36; cause unknown. It was extinguished by John Flore, fire warden, with the help of another person.

Same, November 28th: November 13th a fire burned over 600 acres of prairie, but did no damage. Cause unknown. The weather was very windy. The fire was extinguished in eight hours after it started.

H. F. Burrill, chairman of the town of Hawley, September 17th:

A fire September 17th burned over about 300 acres of mostly prairie, and destroyed probably 40 tons of hay; damage \$100. It was caused by railroad locomotive. It was extinguished by a fire warden, with the help of other persons, by plowing furrows to head it off. Weather windy.

R. Hutchinson, chairman of the town of Georgetown, September 18th:

A field fire September 18th burned over 160 acres of stubble and flax; damage, \$200. It was caused by a threshing setting catching in stubble. The straw had been burned two weeks, and broke out again and ran in stubble. The weather had been dry for ten days.

Peter Wouters, chairman of the town of Cromwell, September 24th:

On the 7th of May a prairie fire, which originated in the town of Spring Prairie, burned over 100 acres in section 31; destroyed nothing but the prairie grass. It was extinguished in five hours by plowing and using wet brooms and sacks.

L. L. Crawford, chairman of the town of Riverton, October 8th:

September 20th a fire, caused by sparks from a railroad locomotive going east, burned over 450 acres of stubble and grass; destroyed 45 acres of wheat in stack, 45 acres of oats in stack, and 5 acres of oats in shock; damage, \$500 to \$600. It was extinguished by plowing and beating. There was a heavy wind.

Same, October 17th: In reply to your favor of the 13th, I will say that Mr. Evans has suffered from five fires besides the one that I sent you a regular report of, making in all six fires, all of which were set by N. P. engines. One on September 18th at 3 P. M., wind south, burned over 20 acres pasture, stubble and woodland, doing probably \$50 damage. September 19th, 11 A. M., 40 acres grass; probable loss \$10; south wind. September 21st, 3 P. M., 40 acres grass; loss \$10; south wind. September 27th, 1:30 P. M., 15 acres of grass, \$3.75. Same date, three acres of grass. I live about five miles south, and the country is hilly, and there is timber between where I live and where these fires occurred, so I could not see them. The weather has been dry nearly all of the fall. I understand that the railroad company has settled nearly all of the loss occasioned by these fires.

H. F. Burrill, chairman of the town of Hawley, October 18th:

On the 18th of September a prairie fire on section 8 burned over about 200 acres of prairie and field, and destroyed probably 20 tons of hay, 150 or more flax in stack; damage, \$275. It was extinguished by plowing to head it off; weather was windy. This fire was on the next day after the former fire reported by me, about one mile further west. I was somewhat in doubt as to the origin of this fire, but on inquiring of different ones, and of employes of the railroad company, and on the company making settlement, leaves no doubt who caused it.

KITTSON COUNTY.

S. P. Almquist, of the town of Skane, April 20th:

The 11th instant a fire burned over 450 acres on section 25, destroyed about 6 tons of hay in stack; damage, about \$20. Weather very dry and windy.

Same, May 24th: On the 6th instant a field and prairie fire burned over about 25 acres of stubble and 100 acres of hay meadow; destroyed about 6 tons of hay in stack; damage, \$36 or \$40. It was caused by a party setting fire to some old grass. Weather dry and windy. The fire was extinguished by plowing and using wet sacks.

Tollef Skatrud, chairman of the town of Deerwood, May 12th:

On the 26th of April a prairie fire, which came from the town of Nelson Park, lying south of here, burned over 6,000 acres and destroyed lots of young poplar trees. Weather very dry. There was a hard wind from the south, and the sand and dust were so thick that I could not see the fire before towards evening. Twenty persons assisted in controlling the fire by back-firing, plowing, and using wet sacks.

Same, May 16th: A fire came into the southwest corner of this town May 5th, and was extinguished in five hours, after it had burned over 300 acres of prairie.

Same, May 27th: I have been to Nelson Park, but could not find any one who had seen how the fire had started. I learned that it started on section 3 in that town. It looked as if it had started near a road lying across that section. There is no settler near there. I have looked over the area burned, and the damage done is difficult to estimate, but I do not think it is very large.

Olof Dahlman, chairman of the town of Poppleton, June 27th:

The 2d of May a fire burned over 200 acres of brush and meadow, but did no damage. It extinguished itself by coming against a coulee.

Louis Melin, of the town of Poppleton, June 28th.

May 20th a prairie fire, caused by clearing land, burned over 2,000 acres of brush and meadow, but did no damage. It was extinguished by backfiring and whipping.

LAC QUI PARLE COUNTY.

E. O. Hertzberg, chairman of the town of Mehurin, April 9th:

On the 6th of April a prairie fire burned over 1,600 acres, but did no other damage but to burn old grass. The weather was dry and windy. I have not been able to ascertain the cause of the fire. I had four men to help control it. There was a fire in the southeast part of the town, and Fire Warden R. H. Lee had 14 men to help control it. He thinks it came from Garfield. There are fires all around us every day. I saw the chairman of the town of Manfred; he claimed the fire came in from Yellow Medicine county.

W. L. Taylor, chairman of the town of Manfred, April 20th:

Yours of the 15th instant is at hand. In reply would say, that the first fire to cross our town occurred on April 2d, coming from the town of Freeland, east of Manfred, which burned the grass of the north one-half of the township. No loss of property that I heard of. Second fire started on the farm of Gus Jensen, in Florida, Yellow Medicine county, April 7th. It was considered an accident, although a straw stack had been on fire for four days previous; a strong south wind fanned the embers and carried them to the prairie grass. Said fire crossed the railroad, went on to Rev. Maesden's farm, burned hay and large stock barn and 14 lambs. Thence across section 30 in Manfred, on into South Dakota, to the farm of Andrew Allen, burning his house and barn and one sheep. The house was large and new. There were ten children in the family. A subscription was started, and sixty odd dollars were raised for them. Said Jensen is a poor man.

Bastian Hanson, chairman of the town of Freeland, May 30th:

A prairie fire April 2d burned over 1,200 acres. It went through Mehurin and Garfield townships before it came into this town, and it did not do any damage in this town. Nothing was done to extinguish the fire in this town, as there was no damage to be done, on account of there being fields on three sides of the fire, so it went out by itself. There was hardly any wind.

D. P. Lister, chairman of the town of Lac qui Parle, May 14th:

I learned to-day that a fire occurred about two weeks ago, having started near the foot of Lac qui Parle lake, on the south side, and thence running





northwest for a distance of three miles, and burning a territory of about one-half mile wide, destroying some young timber and a few posts. Do not know who started the fire.

Same, May 19th: In view of the fact that the foot of the lake is frequented by parties fishing and hunting, who live away at a distance therefrom, it will be readily seen that such parties may easily escape detection. Also there is no one living within three-quarters of one mile from the place where the fire started, nor could any of the interested parties see the fire when started, while at their usual avocations at that time of the day. If the fire was started by party or parties who were non-residents, they could readily get away and all traces of them be lost, which I have reason to believe was the case in this instance.

P. P. Digre, chairman of the town of Garfield, November 10th:

On the 27th of October a fire on sections 29 and 30 burned over 300 acres, and destroyed hay of the value of \$100. It is claimed that it started from a threshing machine which passed by at the time. The fire was extinguished by plowing.

LINCOLN COUNTY.

Fred Joyut (justice of the peace), of the town of Shaokaton, April 13th:

On the 11th instant the wind was blowing a gale, when one Tees put out fire on his land, which in less than five minutes was beyond his control. The fire crossed the public road, in fact it went everywhere, as no force of men could have stayed it; threatened the haystacks of Fred Hatchard, who by great exertions, and with use of plows, saved the hay; then it struck the farm of William Jones, and only by heroic labor was his granary and 500 bushels of wheat saved, while his fine grove of several acres and hundreds of forest trees was completely burned over, and no doubt will die. Unfortunately, the offender is an old man and irresponsible in means, while the victim loses the work of 16 years, which he values at \$500.

Same, April 26th: The damage by fire can never be counted in dollars, as the grove was a fine one, and 16 years of labor and care are gone. Many posts are burned, fence prostrate, and yet the offender who acknowledges he put out the fire has not come near to offer to settle. On Sunday evening, the 24th, we had a violent storm of wind, and fires on the south line of our town which had been smouldering burst out, and for a time threatened great destruction. I have not yet learned of the damage done, but it is evident that drastic measures are necessary to insure obedience to the law and safety to life and property.

William Dorn, chairman of the town of Shaokaton, May 9th:

Yours of April 28th received. It took me two days to investigate the matter, as the witness you gave me would not testify that he had set the fire. I then went before a justice of the peace and made complaint, and the offender, Mr. Tees, came in open court and plead guilty, and the court fined him \$1 and costs.

MARSHALL COUNTY.

O. L. Skonovd, chairman of the town of Comstock, April 28th:

Your letter received. Yes, there was a prairie fire here the 14th instant, and there have been prairie fires around here for more than three weeks besides, here is so much land that has not been settled. The damage the fire did the 14th was a hay stack worth about \$10; and the 24th of April a bridge was pretty nearly burned; damage, about \$50. There were seven men working there to get the fire out. I have been hunting for the fellow that set the prairie fire, but I cannot find any proof. I did not know that it was my duty to look after these fires before I received the circular from you. I did not get any instructions from the previous chairman.

Henry E. Turner, of Stephen, April 20th:

I would like to ask your advice in regard to the prairie fire. I have a tree claim on section 22, town 157, range 49. On this claim I had 10 acres of fine cotton trees and box elder trees, which were burned on the 18th of this month. I did not see the man set the fire myself, but another man saw two men working on the southwest quarter, and where he saw the fire start from. Besides the trees, there were two stacks of hay burned.

Same, May 9th: I got the chairman of my town and the other two men of the town board to look the matter up, and they found where the fire started from. The chairman of my town wants me to go and arrest the party that is supposed to have caused the fire, and he wants me to pay all the expenses, and he will not have anything to do with it. I do not believe in such a law. I should think it his place to arrest the parties and prosecute them himself.

Henry Roller, chairman of the town of Grand Plain, May 15th:

May 13th a fire burned over 400 acres (township 155-41), and did damage to the amount of \$100; it originated on the Indian reservation. The weather was very dry and quite windy. The fire was extinguished in five hours. Supervisor Johnson was present.

A. O. Bjurseth, chairman of the town of Spruce Valley, May 17th:

There have been several fires here this spring, but no damage done except one man lost his barn accidentally. The land here is mostly brush land or very small poplar groves; there is no large timber at all.

H. Amundson, chairman of the town of West Valley, November 15th:

A prairie fire occurred November 15th; it burned over 60 acres of brush. It was extinguished by me.

MURRAY COUNTY.

Mikkel Bly, chairman of the town of Ellsborough, May 26th:

April 16th a fire burned over 640 acres of prairie in the south part of the town, but nothing was destroyed.

Same, November 2d: October 28th a fire burned over 160 acres on section 17, and destroyed 14 tons of hay belonging to Joseph Helland, and 20 tons belonging to W. Johnson; damage, \$70. It was caused by setting fire to a straw stack.

NORMAN COUNTY.

C. M. Bell, chairman of the town of Hegne, November 5th:

A prairie fire November 3d burned over 1,240 acres of prairie hay land, and destroyed about 1,000 tons of hay, one barn, two stacks of grain, and did damage to the amount of \$2,500. It was caused by burning straw. One fire warden was present to help extinguish the fire.

William Oedor, chairman of the town of Good Hope, November 7th:

On the 5th instant a prairie fire which originated on section 21, being vacant land, burned over 3,060 acres, and destroyed about 100 tons of hay; damage, \$300. The weather was dry and a stiff northwest wind. The fire was extinguished by plowing and using such tools as came to hand.

OTTER TAIL COUNTY.

William Zimmer, chairman of the town of Carlisle, September 23d:

On the 21st instant a fire, caused by sparks from a locomotive, burned over fifty acres and destroyed sixty tons of hay; damage, \$180. Six persons were called to help extinguish the fire, which was done by plowing around, but the wind was too high, and we had to use wet sacks to pound with, also scatter earth with spades. It was all we could do to save the owner's hay.

POLK COUNTY.

L. J. O'Neill, chairman of the town of Chester, May 30th:

There have been at least a dozen small prairie fires set by the settlers to clear off hay land, etc., and so far I have not heard of any harm being done by fire in our town.

E. A. Engebretson, chairman of the town of Eden, June 2d:

In the first part of May a prairie fire burned over ten acres of meadow and destroyed about thirty rods of corduroy on the public highway; damage, \$10.

Charles Rigeimbal, chairman of the town of Crookston, June 27th:

A fire in April burned over twenty acres and destroyed a stack of hay; damage, \$30.

Ole P. Onstad, chairman of the town of Onstad, September 22d:

On the 20th instant a fire, caused by sparks from a locomotive of the east-bound freight train, burned over 100 acres, and destroyed 15 acres of flax which was cut and 75 shocks of oats; damage, \$200. It was extinguished by using wet gunny sacks. The wind was southeast.

Same, September 28th: The east-bound freight train which passed Holmes station about 11 o'clock A. M. yesterday, September 27th, set fire to prairie and burned over 1,900 acres of prairie, destroying houses, a school house,

grain, hay, fences, and in fact everything in its way; the wind was blowing at a terrible way from the south, and nothing could stop the fire. Our school house burned, and it caught in the shingles when the fire was six or eight rods off. The damage done will amount to at least \$2,000, if not more. I had my men put the fire out last night, working all day Tuesday and until 1 o'clock last night.

Same, October 1st: The damage done by the fire September 27th was \$3,000. The wind blew at the rate of fifty or sixty miles an hour, and nothing could be done. During the night we put it out on section 16. It burned north to the Great Northern track in town of Kertsonville. The weather had been dry for a long time, and high wind from the south.

Ole Olson, Jr., chairman of the town of Russia, January 27th, 1899:

On the 2d of November a fire originated on section 7, from section men on the Great Northern railroad burning the right of way, burned over 2,000 acres and destroyed hay and oats in the stack of the value of \$550. It went out five hours after it started by dampness of grass, in the evening the wind going down.

Michel St. Aubin, chairman of the town of Kertsonville, October 29th:

On the 27th of September, in the forenoon, a fire burned over 1,300 acres of prairie and stubble, destroyed one stack of hay and some shocks; damage, \$90. The weather was dry, with a high wind. The fire could not be controlled; it ran six miles in two hours.

Same, December 26th: When I made my report I did not know where the fire started, but Mr. Benoit, a fire warden, went to investigate the matter, and told me the fire started at the Northern Pacific railway; that the locomotive set the prairie on fire. It started three-quarters of a mile from Holmes station and ran from there to Kertsonville. It ran from the town of Onstad to Kertsonville town, and into Tilden town. The section men on the Northern Pacific railway told Mr. Benoit that the fire could not be controlled. It was too advanced when they saw it.

A. P. Moen, chairman of the town of Vineland, December 12th:

A prairie fire November 12th burned over 400 acres of meadow; did no damage. It was caused by parties burning around their hay stacks, and was extinguished in three hours by using wet sacks. There was quite a breeze from the west. I started as soon as I learned there was a fire, but it was extinguished before I reached there.

RED LAKE COUNTY.

Mangus Winberg, chairman of the town of Numedal, May 11th:

On the 8th instant, the weather being very dry and considerable wind, a fire burned over 1,000 acres of prairie, meadow and light timber; destroyed two stables and a granary, and forty acres of light timber; damage, \$100 to buildings and \$50 to the light timber. In the morning I saw the fire from my house, and I proceeded immediately to extinguish it, having the help of ten persons.

Joseph Pigeon, chairman of the town of Poplar River, May 14th:

On the 29th of April, a fire burned over 100 acres of meadow, and destroyed a stack of hay; damage, \$30.

Same, May 22d: The person who set the fire was prosecuted before a justice of the peace and paid a fine.

A. J. Hemstad, chairman of the town of Emardville, May 18th:

On the 14th instant, a fire, which originated on section 27, burned over about 200 acres of brush and light timber; damage, \$20. It was extinguished in twenty-four hours, by the help of seven persons. We saved several cords of wood, and we had to watch along the roads on all sides.

A. Beaushene, chairman of the town of Louisville, June 4th:

April 15th, a fire burned over 5000 acres of prairie and gravel; it did not do any damage. It was vacant land. Weather dry and windy. Three or four persons tried to control the fire, which was finally extinguished in the night by rain.

Same, June 22d: The fire, April the 15th, burned over 500 acres in the northwest part of the town, mostly meadow. It did very little damage, if any. Weather very windy. In the night came a rain, which extinguished the fire. These sloughs are burned over every year.

O. L. Larson, chairman of the town of Sanders, November 3d:

On the 2d instant, a fire burned over 300 acres of brush prairie, destroyed about eighteen tons of hay; damage, \$40. It was stopped against a road by backfiring. The wind was blowing hard from the southwest. Regarding the origin of the fire, there is strong circumstantial evidence, but no one saw the party set it.

Same, November 7th: The party setting the fire admits the fire started from his pipe while smoking, and then he could not stop it. He is willing to pay for the hay that burned up, and is sorry and in hard circumstances.

Charles P. Swanson, chairman of the town of Bray, January 10th, 1899:

On the 24th of April, a prairie fire in the south part of the town burned over about 200 acres, destroying nothing but grass. It was set by some unknown party in the evening of the day before in the adjoining town, the wind being south, and started of itself again in the forenoon of the 24th, weather being drier. It was extinguished in three hours by the neighbors who discovered it. I was confined to the bed during the time; was not able to be out.

REDWOOD COUNTY.

L. C. Burden, chairman of the town of Springdale, May 13th:

April 26th, a field fire burned over 80 acres; damage, \$200. It was caused by burning straw, and the wind was blowing a gale from the south.

Same, June 2d: I went and saw the man that set that fire. He admits setting it; said he was willing to pay all damages. He has put in the bridge, and paid the man for the hay he burned. He said it was an accident. I think he had a lesson that he will remember some time.

Howard Honner, chairman of the town of Honner, September 12th:

On the 3d instant, a fire, caused by sparks from a locomotive, burned over forty acres, destroying twelve tons of hay; damage, \$15. It was extinguished by a backfire, free use of shovels and wet sacks. Weather windy.

Theodore Daube, chairman of the town of Vail, December 13th:

On the 19th of September, a prairie fire, caused by burning stubble, burned over 160 acres, and destroyed a small bridge of the value of \$6. The weather was windy. Nothing was done except to save a couple of hay stacks, as the land was surrounded by roads.

ROSEAU COUNTY.

O. P. Gaukerud, chairman of the town of Jadis, May 18th:

No fire exists in this township that I can find out. Small patches have been burning this spring, but no damage done as far as I can learn. I have never been called upon to extinguish any fire. Yesterday the wind was from the south and a heavy smoke was lying over the country, and there must be a fire somewhere south in the swamps. This morning it has been raining for two hours; is raining still, so all fires, if any, will likely go out.

P. Skog, chairman of the town of Spruce, May 19th:

The spring has been dangerously dry. No damage to any account in this town, but in the neighboring territory east of here [unorganized] I think a large area of timber has been burned over. We have seen smoke and fire over there nearly every day many weeks.

STEVENS COUNTY.

Andrew Hardin, chairman of the town of Scott, September 17th:

The 17th instant, a fire, caused by burning a straw stack on section 7, burned over 800 acres, destroyed six stacks of wheat and two of oats and hay; damage, \$250. High southwest wind. The fire was extinguished in four hours by plowing and other means.

Same, October 12th: The weather was dry, and had been for several days.

A. A. Peck, chairman of the town of Hodges, September 23d:

On the 14th instant, a fire, caused by sparks from a locomotive, destroyed four acres of oats in the shock. Another fire the same day on section 29 burned two stacks of hay and burned over quite a large tract of stubble ground and wild sod.

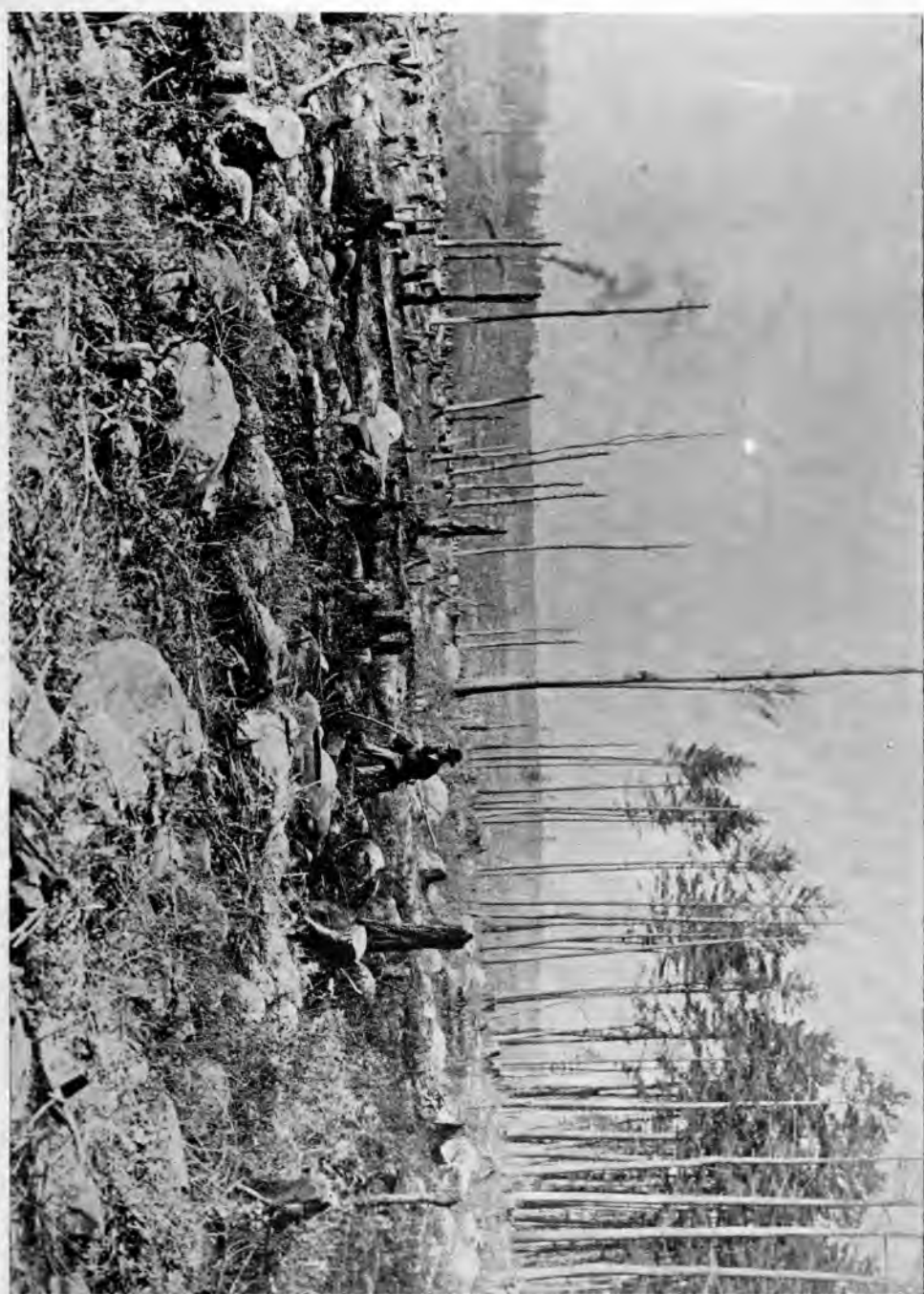
Carl Leaman, chairman of the town of Baker, November 29th:

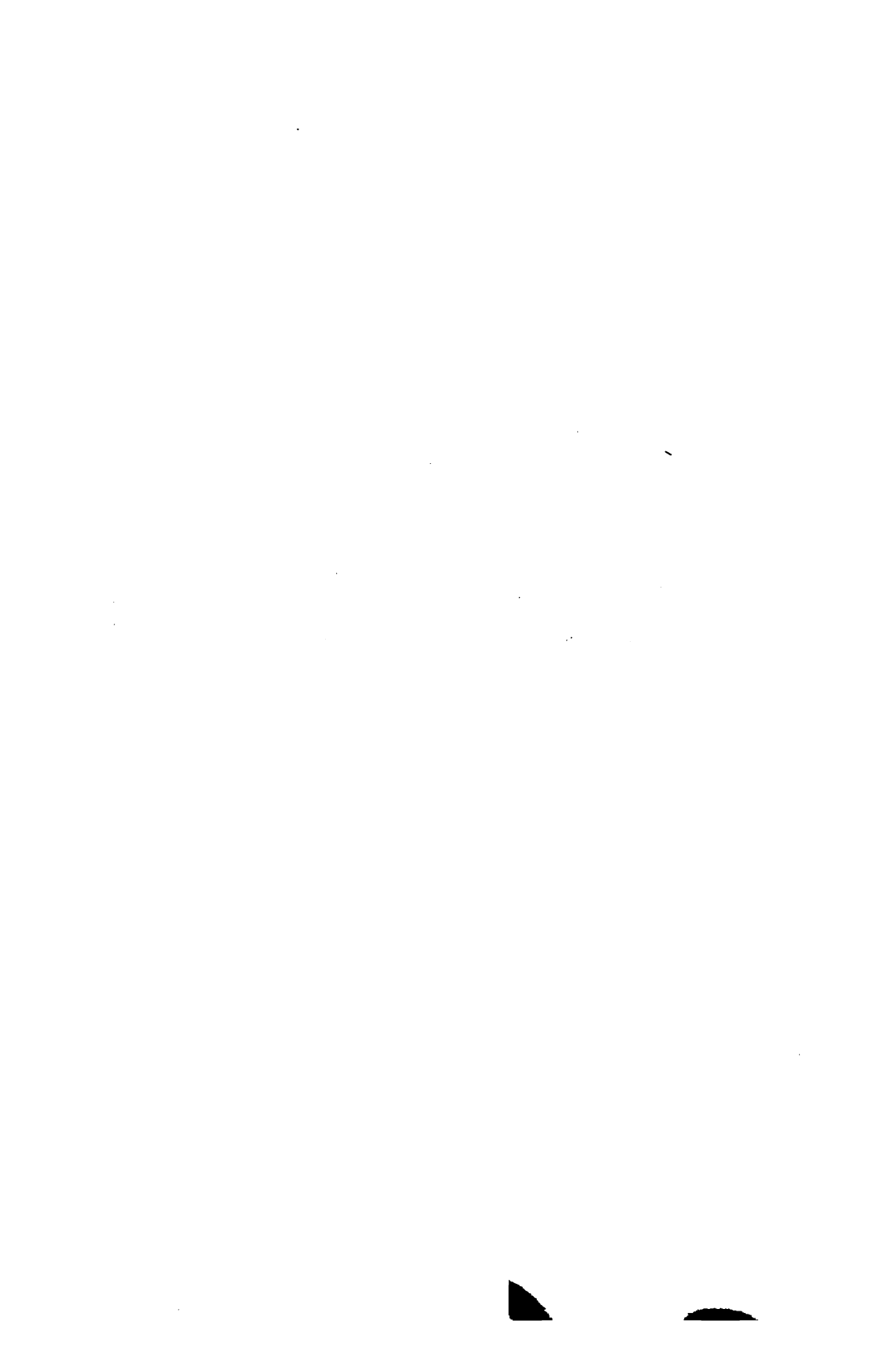
A fire, on the 15th instant, burned over 300 acres of prairie, but did no damage whatever.

TODD COUNTY.

J. G. H. Brevet, chairman of the town of Ward, July 6th:

On the 12th of April, a fire, on sections 25 and 26, burned over about 600 acres of meadow; destroyed sixty tons of hay; damage, \$30. The weather was quite dry.





WILKIN COUNTY.

John A. Falla, chairman of the town of Akron, May 16th:

April 15th, a fire, which was set by an irresponsible person on section 17, burned over 640 acres; destroyed a bridge on the public highway; damage, \$15. The weather was dry and not very windy.

Stanislaus Bulik, fire warden of the town of Mitchell, June 27th:

A prairie fire, March 4th, which was set on section 12 from cause unknown, burned over 600 acres, but did no damage; it was put out with wet sacks.

Martial Beauden, chairman of the town of Roberts, October 8th:

On the 27th of September, a fire, which originated on section 15, being land occupied by Frank Marick, burned over 640 acres, and destroyed about twenty stacks of hay of the value of \$240. It was extinguished in four hours after it started by the work of seven men and five horses, with plows. The weather was very windy and dry, and had been very dry for several days. If the fire had not been extinguished it would have destroyed about 100 tons more of hay, and it is hard to tell where it would have stopped.

Hamilton Deal, chairman of the town of Nordick, November 8th:

September 3d, a fire, originating on section 3 from burning straw (land occupied by Frank Van Hook), burned over 20 acres of prairie. It was extinguished in four hours by the use of wet sacks. Strong wind from the west, but not very dry.

YELLOW MEDICINE COUNTY.

Christen Olson, chairman of the town of Florida, April 2d:

March 30th, a fire in the southwest part of the town, which originated in the town of Fortier, burned over 1,280 acres; damage, \$125. It was extinguished in five hours, by the help of 10 persons.

Same, April 9th: On the 7th instant, a fire, which originated on section 20 from fire left in an old straw stack burned a few days before, burned over 1,500 acres; damage, \$400. It was extinguished in eleven hours by the use of wet rags and shovels, and by plowing. Weather very dry and windy.

Same, April 28th: On the 27th instant, a fire, which originated in South Dakota, came into our town on section 30, and burned over 620 acres of prairie and brush; damage, \$200.

Same, May 28th: Could not find evidence enough against the party causing the fire of April 7th strong enough for conviction. I can find plenty of complaint, but no evidence.

Same, September 29th: On the 28th instant, a fire on vacant land in section 23, caused by locomotive on freight train, burned over 350 acres, destroying prairie grass. Twelve persons assisted in extinguishing the fire. Weather dry and windy.

Elef O. Helgemoe, chairman of the town of Norman, May 13th:

May 5th, a fire, which came from the town west of this, burned over 350 acres, but did not do much damage. It was extinguished by six persons with wet rags and willow brooms. Weather dry, with northwest wind.

INSTRUCTIONS TO FIRE WARDENS.

Under date of April 22d, three printed copies of the following circular were sent to each chairman of town board of supervisors in organized towns in the forest and prairie regions, blank for fire report and return stamped envelope; also one to each fire warden in unorganized territory:

C. C. ANDREWS,
Chief Fire Warden.

R. C. DUNN (State Auditor),
Forest Commissioner.

CIRCULAR }
NO. 11. }

STATE OF MINNESOTA, }
OFFICE OF CHIEF FIRE WARDEN, }
St. Paul, Minn., April 22, 1898. }

To Fire Wardens:

We are entering upon the fourth year of the Fire Warden Law, and as a number of new Fire Wardens have been elected, it seems proper to call particular attention, in substance, to a few of the provisions of the law, namely:

Supervisors of towns are Fire Wardens.

Mayors of cities are Fire Wardens.

Presidents of village councils are Fire Wardens.

Fire Wardens shall post, or cause to be posted, warning placards.

Fire Wardens shall take precautions to prevent the setting of forest and prairie fires.

Fire Wardens shall enforce the provisions of the law.

This means that, among other things, they shall make complaint against parties who violate the law and endeavor to have them punished. Circumstantial evidence is sometimes sufficient to convict. A person who in very dangerous weather causes a fire which endangers the property of another is liable under section 9.

Chairmen shall inquire into the cause of each forest or prairie fire within their districts and shall report the same, etc.

This means that they shall make a prompt and thorough inquiry, and prompt report to the Chief Fire Warden.

The Chief Fire Warden has general charge of the Fire Warden force of the State; consequently his reasonable orders and instructions are to be obeyed with promptitude.

Any Fire Warden who refuses or neglects to perform his duties shall be deemed guilty of a misdemeanor and shall upon conviction thereof be punished by a fine of not more than \$100 or imprisonment in the county jail not to exceed three months.

District courts as well as justices of the peace have jurisdiction of offenses under the Fire Warden Law.

In case a Fire Warden is to be absent even for only half a day he should arrange to have someone act in his place.

Fire Wardens will please preserve this and other printed instructions which they may receive and turn the same over to their successors.

Respectfully,

C. C. ANDREWS,

Chief Fire Warden.

COMPENSATION FOR POSTING PLACARDS.

STATE OF MINNESOTA,
OFFICE OF CHIEF FIRE WARDEN,
St. Paul, Minn., September 14, 1898. }

To County Commissioners:

With a view to economy and uniformity of expense I would request that in auditing the accounts of Fire Wardens County Commissioners do not allow to exceed four dollars in all in any one township in any one year for posting the warning placards mentioned in section 4 of the Fire Warden Law of April 18, 1895. Where charge is made for posting placards the account should show the number of such placards posted.

Very respectfully,

C. C. ANDREWS,

Chief Fire Warden.

SOME OF THE COUNTRY IN BELTRAMI COUNTY.

Just after the middle of August I visited eleven wooded townships in Beltrami, one of Minnesota's three mammoth counties (it being my second trip into that county), where settlement has been greatly stimulated the past two years by the prospect of exceptionally favorable railway communication. Eleven townships have been organized the past year. The country is traversed by the newly extended Duluth, Superior & Western railway; and the Brainerd & Northern Minnesota railway then graded into it from Walker has since been completed to Bemidji; also,

the Great Northern has been extended into the county from Park Rapids. On the first of these routes the important lumber center of Cloquet is passed; also the town of Grand Rapids, capital of Itasca county, and whose court house and school house are among the handsomest in the state. West of Cloquet the route for quite a stretch along the bank of the broad and full St. Louis river is beautiful, and offsets several miles of swamp and dwarf spruce further on. But there are some areas that were ravaged by fire previous to 1895. From the village of Deer River to Bemidji the country is generally level. The railway runs in a straight line for about twenty miles. There are but few cuts and none very deep. For many miles west of Deer River tamarack forest predominates, yet there is some cedar and occasional belts of large-leaved, principally poplar timber. About all the ridges have a good growth of Norway and white pine, and there is a magnificent body of the latter near Cass lake. Between Deer River and Cass lake there is hardly a trace of fire.

From Cass lake west is gray or jack pine forest to a considerable distance beyond Bemidji. The country is well watered with clear lakes and streams. Some homestead farms have been opened on jack pine land and are reported as fairly productive. All of our Minnesota crops appear to yield well on soil that is well tilled. The vegetables grown around Bemidji are of a superior quality. There are natural hay meadows, but the livery man at Bemidji, who furnished me a team, said he paid \$40 a ton for hay last winter. This was because of the immigration and railroad building. In fir forest, on soil of sandy loam, I saw an abundance of the wild pea, which is eagerly eaten by cattle, and is regarded as evidence of fertility. Again amidst other shrubbery there will sometimes be seen an acre or more in extent, of the pink, two or three feet high, spear-headed flower called the great willow herb. Among the



Between Deer River and Cass Lake. Twenty miles of such country along the Great Northern (Fosston extension) Railroad. Scarcely any damage had, in August, 1898, been done by fire; and if fire is kept out the route will prove much more attractive for tourists. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Appearance, August 14, 1898, of the site of the present village of Cass Lake. Engineer Alex. Stewart's office on left; Operator Hunter's office on right. Country covered with jack pine forest. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

most frequent plants in the hardwood forest are the life of man and the sarsaparilla.

The new, bright little two-year-old village of Bemidji, at the foot of the six-mile long and handsome lake of that name, is the capital and principal business center of Beltrami county; and while the surrounding country is generally level, there are on the west side of Bemidji lake, and again near Turtle lake, hills about two hundred feet high and covered with hardwood forest.

Although jack pine predominates in the neighborhood of Bemidji there are intervening areas of red or Norway and some white pine; also considerable bodies of mixed hardwood, which latter prevails where the surface is undulating. The whole shore of Bemidji lake is bordered with forest, and much of it hardwood—maple, white birch, oak, ash, elm, basswood, poplar, etc. Many settlers have taken charming homestead sites on the hardwood shores of lakes. I remember one in particular that I passed over at the north end of Lake Julia in the south part of township 149, range 33. The soil was black and rich and the timber largely white birch, with other varieties of hardwood, all standing close, tall and luxuriant, with here and there a handsome pine. Such land is easily worth \$25 an acre now. Some vacant homestead sites were pointed out to me in the vicinity of Buena Vista which desirable families could no doubt be guided to on application to responsible residents.

The jack pine, which is found only on sandy soil, seldom has any mixture of other trees, grows generally in close stand, having a uniform height of thirty to forty feet. It is valuable for shingles and fuel; some insist that it makes good lumber for finishing. I saw many extensive bodies of this timber which would net \$25 in value per acre. In a forest of pretty close-standing trees of this species, with stems free from branches, I saw jack pines a foot high

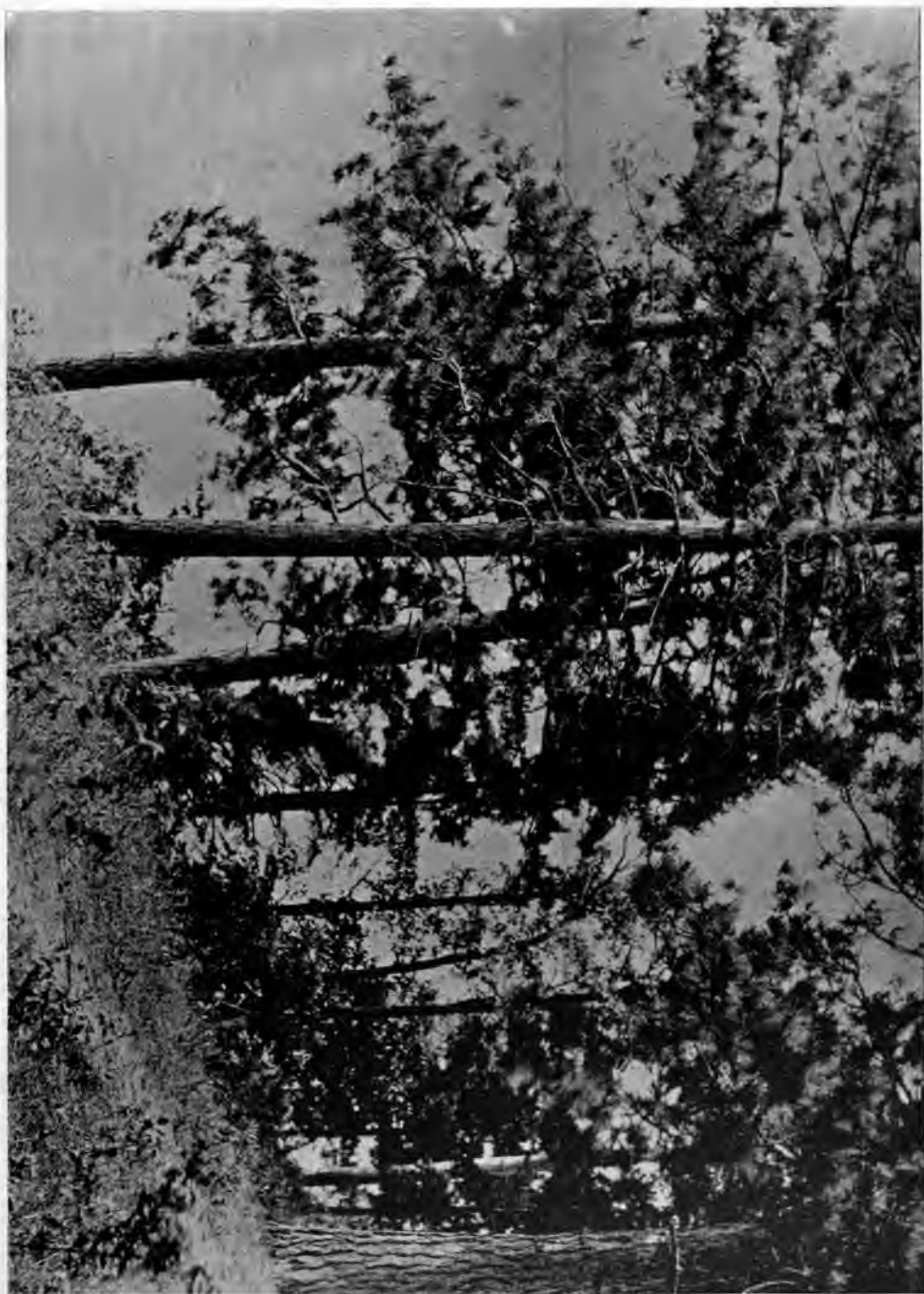
averaging 3,000 to the acre, which shows clearly enough how such pine will reproduce itself if fires are prevented.

Also in repeated instances I saw young Norway pine which had grown up so thickly as to almost cover the ground in presence of their full grown progenitors. I had the pleasure of seeing this on a school section of land, belonging to the state. I also saw considerable young white pine in white pine woods, but which of course, had not been scourged by fire. In these forests I was struck, as I often have been, by seeing lying on the ground numerous decayed trunks of trees of the same species which belonged to a former generation. Some of these decayed trees had been lying there nearly a century. While walking amid majestic living trees one actually walks over the graves of trees. Many of these remains have so shrunk by age as to be no higher than the little mounds in an old church yard. The presence in a pine forest of such remains, together with a young growth, as can be seen in so many instances by any one who cares to see, abundantly refutes the error which obtains to some extent that there is not a second growth of pine on the same land. Keep out the fires and the natural reproduction from seed will be perpetual.

In passing through some of the larger forests I was frequently struck by the absence of singing birds. The hawk is often seen, but the smaller birds hop about in silence.

There is nothing in the appearance of a white pine tree that could account for its name. It is called "white" because of the very light color of its wood. White pine is that clear, soft, but durable wood generally used for finishing, and which yields so readily to the knife. Standing in the forest, the bark of the full grown white pine has a pleasant slate color. Grown in the open, this or any other fir tree begins near the ground to send out branches, and in such situation does not make good timber; but in close stand in the forest, height growth is promoted, the limbs are shed, and at maturity it has a noble and beautiful shaft

6. Dandel Lake about three-quarters of a mile northwest of the village. Norway pines. Photographed 1898.



free of branches for a distance of fifty or more feet from the ground. The white pine is the most valuable tree in the world and flourishes especially well in Minnesota. The red (or Norway) pine takes its name from the light red color of its bark.

The standing timber of all sorts which is exclusively the property of the state of Minnesota is estimated now to be worth \$10,000,000. Some of this, by rapid growth, increases in value at the rate of 7 per cent per annum. On an average its increase in value, if fires are kept out, will be $3\frac{1}{2}$ per cent compound interest. In twenty years at this rate its value will have doubled and will then amount to the magnificent sum of \$20,000,000. Such a fact should impress every citizen of the great importance of protecting the forests, if only on account of the state's separate interest therein.

The estimate which I gave in 1895 of standing white pine in Beltrami County was 1,500,000,000 feet, board measure; of Norway pine, 350,000,000 feet. Several expert woodsmen have approved the estimate.

Mr. T. H. Croswell an experienced government surveyor has, at my request, furnished the following notes respecting the country in Beltrami county, north of Red Lake:

That part of the state which, roughly speaking, is bounded by Lake of the Woods on the north, Red Lake on the south, the Red Lake reservation boundary on the east and on the west reaches out to meet the prairies of the Red River valley, is the least touched by the hands of the whites and the last piece of ground to pass from the possession of the Indian. Here in a tract 40 miles wide and 70 in length there is even now no trace of civilization beyond the settlers' cabins on its various borders, save the surveyor's marks that mutely speak of the coming of a new race. Far away from the present lines of travel this stretch of country yet remains the haunt of the moose and caribou, while on the streams the beaver remain in sufficient numbers to maintain their dams and houses.

In general the land from its centre in Tp. 159, R. 35 W., slopes gently to the four points of the compass. Though level to the eye it descends with sufficient fall to give a strong current to the streams.

Possibly two-thirds of the land would now be classed as swamp, a large portion of the muskeg variety underlain as a whole by a clay subsoil. Where the land rises above the level of the swamp there is a good soil, which will make valuable farms. The swamp lands hold water the whole year, and to become available will require large drainage operations. Directly north of Red Lake is one swamp some 12 miles by 25 which must be entirely drained. Much of the soil in the swamp when drained will be a mass of decayed wood and will be likely to burn up, lower the level of the land some two feet, but leave a land of considerable value. Cases occur in the swamps where in extremely dry seasons, tracts have burnt out and now appear as lakes some three or four feet deep. Along the creeks are some fine meadow lands, and as a whole the country offers fine opportunities for grazing purposes. This has been the first use the country has been put to along its western border, and in all probability will be the first use of the whole tract. The timber consists of spruce, cedar, tamarack, aspen, birch and pine; in the wet places, scrubby, and of no particular value. The first fires will entirely destroy it. The dry lands bear valuable spruce timber, trees reaching 3 feet in diameter and 100 feet in height. This is the most valuable and most extensive timber of the region. The tracts of pine have suffered as elsewhere great damage from fire, but there still remain a few isolated tracts of white and Norway pine. It is, however, safe to say, that at the present day on the entire ceded lands north of Red Lake there are not over forty million feet of these valuable trees.

Outcrops of rock are found in only two or three places and these may be merely extra large boulders.

STATE UNIVERSITY PINE LANDS—OPPORTUNITY FOR A DEMONSTRATION FOREST.

A golden opportunity is at hand for the State of Minnesota to raise its rank in science quite a little. It is a chance which the regents of the university have of setting apart an important area of pine timber land as a demonstration forest for use of the school of forestry connected with the agricultural college and experiment station. In general the university lands must be sold by the land commissioner (state auditor), as other lands which are granted to the state by the United States for educational purposes are sold; but there were certain salt spring lands belonging to the university which were left to the exclusive control of



beautiful forest of virgin Norway pine belonging to the State University, on the north of Vermillion Lake. Where light has been admitted a natural and thick growth of young pine has sprung up. An ideal picture of natural reproduction. Would make a fine demonstration forest for the School of Forestry. Photographed, 1898, for the Annual Report of Chief Fire Warden of Minnesota.

the regents of the university. Some of these salt spring lands a number of years ago were relinquished to settlers who had made improvements upon them, and in lieu thereof the United States secretary of the interior has lately certified to the state upward of three thousand acres of valuable pine lands, designated as university salt spring indemnity lands. This important acquisition was accomplished through the long continued, indefatigable efforts of Mr. W. P. Jewett, public land expert, as agent of the regents of the university. About 2,500 acres of the lands are in township 63, range 16, and lying mostly on the north shore of Vermillion lake, and about 1 000 are situated in township 61, range 14, all being in St. Louis county and distant only from ten to fifteen miles from the city of Tower.

Going from Tower on a steamboat I visited the most of these lands that are situated in township 63, range 16, in the latter part of September. Their surface is undulating; much of the soil is only a few inches deep, resting on granite or trap rock, sometimes in solid ledge, in some places in broken pieces, a soil favorable for forest growth, but unsuited for agriculture. There are areas of wholly white pine, of wholly Norway pine, the two mixed: and again both sorts mixed with hardwood. The pine trees vary from a foot to two feet and upward in diameter, and the more mature pines are about one hundred years old, and some are over one hundred feet in height. The pine will average all the way from 100,000 feet to 400,000 feet on forty acres. There is also much young pine, and the situation is favorable for protection against fire and theft.

If the pine on this land should be sold to the highest bidder and lumbered in the usual way the proceeds would amount to several thousand dollars; but if the timber should be cut clean, it would be liable to be burned over, the chances for reproduction of forest would be very poor, and, worse than all, the thin coat of soil over much of the area would be washed away and nothing left but a desert of

naked rock. If, on the other hand, it should be placed under the charge of the experiment station for the practice of the school of forestry it could in the end be made to yield a hundred-fold more revenue to the university. In such case the management of the land, briefly stated, would be this: The school of forestry, at the head of which is Professor Green, author of a valuable manual of forestry, would survey and map the land; clear such lands as are necessary for fire breaks; estimate and record the amount of timber on each subdivision; mark and count trees that ought to be cut in the first decade; take steps to have them sold at the best market; keep accurate accounts of sales and proceeds; make estimates of future yields; take care of the young growth; plant young trees where there is need of planting, in a word, to manage the forest on forestry principles so as to secure a sustained and perpetual revenue and in a way that all details could at any time stand the test of rigid inspection by any disinterested forest expert. In this way the students at the school of forestry, which forms a part of the university, would become proficient in the practice as well as the theory of forestry, and the State University of Minnesota would outrank all other universities, except Cornell, in this country in this important science, which is so rapidly coming to the front.

NEW LEGISLATION IN MINNESOTA ON FORESTRY—FOREST RESERVES.

The recent legislature of Minnesota took a forward step in forestry by enacting the so called Cross bill for forest reserves which is printed below. It was deemed good policy to have the bill introduced, as was done, in the same form except one or two verbal changes, in which it passed the House of Representatives two years ago after considerable discussion.

The main purpose of the act is to afford a way for the state to receive donations of cut over or other lands not

suited for agriculture and which may be used for growing timber. It is supposed that some owners of cut over land will give to the state, for forestry purposes, such tracts as are not likely soon to become saleable for farming purposes, rather than continue to pay taxes thereon. If the state should thus acquire land it is provided that two-thirds of the revenue therefrom shall be appropriated for public education (and to such public educational institution as the doner designates, in case he chooses to designate any institution) and one-third to the state for care and protection of forests, such third, however, to be divided so that the state shall retain one half and the town and county in which the land is situated shall each have one fourth in lieu of taxes on the land. The lands are to be known as "Forest Reserves" and their administration according to forestry principles is by a "Minnesota State Forestry Board" of nine members to serve without pay and to consist of the Chief Fire Warden, the Professor of Horticulture in the university, three persons to be selected by the regents of the university and a member each to be selected by the Forestry Association, the State Agricultural Society, the Minnesota Horticultural Society and the State Fish and Game Commission. The governor is to commission the persons so selected if he deems them competent. The Board may appoint a secretary and the state treasurer is to act as the treasurer of the board. The act carries an appropriation of one thousand (\$1,000) dollars annually.

There is a provision in a law of New Hampshire somewhat similar to the principle in this act. Section 4 of a law of New Hampshire March 29, 1893, creating a Forestry Commission, provides that "whenever any person or persons shall supply the necessary funds therefor, so that no cost or expense shall accrue to the state, the Forestry Commission is hereby authorized to buy any tract of land and devote the same to the purpose of a public park." Under this provision the State of New Hampshire has acquired some forest tracts in the White Mountains.

AN ACT TO ENCOURAGE THE GROWING AND PRESERVATION
OF FORESTS, AND TO CREATE FOREST BOARDS AND FOREST
RESERVES, AND TO APPROPRIATE MONEY THEREFOR.

Be it Enacted by the Legislature of the State of Minnesota:

SECTION 1. There is hereby designated forest reserves for the state, to be known and designated in all public documents as the "Forest Reserves," to be managed and controlled as herein provided, which shall consist of all such tracts and parcels of land as shall be set apart from any state lands, by the legislature, for forestry purposes; or which shall be deeded, devised, or granted to the state for forestry purposes, under the terms of this or any subsequent act, by any person or persons; or granted to this state by the United States government for forestry purposes, where such grants from the United States government have been accepted by the legislature of this state; or given or devised outright, for forestry purposes, to the state, by any person or persons.

SEC. 2. There is hereby created a forestry board for the state, to be known and designated in all public documents as the "Minnesota State Forestry Board," which shall consist of nine (9) members, to be designated or chosen as follows, to-wit:

1st. The person who by law is for the time the chief fire warden of the state shall be ex-officio a member thereof.

2d. The person for the time occupying the chair of horticulture in the agricultural department of the University of Minnesota shall be ex-officio a member thereof.

3d. Three (3) persons, citizens of the state, shall be recommended for appointment by the regents of the university in January, or as soon thereafter as possible, of every other odd-numbered year, commencing in eighteen hundred and ninety-nine (1899), for a term of four (4) years each, one of whom shall be selected on account of his interest in and knowledge of the planting, cultivation and preservation of forest trees and groves, in the prairie regions of the state; one of whom shall be selected on account of his interest in and knowledge of the best methods for the preservation of the natural forests of the state, and of reforestation denuded lands; and one of whom shall be selected on account of his interest in and knowledge of the best methods of protecting the sources of supply of the several river systems of the state.

4th. Four (4) citizens of the state shall be recommended for appointment as members of said board, as follows, viz.: One by each of the following named associations or bodies, for a term of two (2) years

each, in January, or as soon thereafter as possible, of each odd-numbered year, as follows, to-wit: The Minnesota State Forestry Association, the Board of Managers of the Minnesota State Agricultural Society, the Minnesota Horticultural Society and the State Fish and Game Commission.

5th. The recommendation for the appointment of such members shall be properly certified by the proper respective officers of such associations or bodies to the governor of the state, who, if he shall deem the persons so recommended suitable and proper persons therefor, may appoint and issue a commission to each of them; vacancies in membership shall be filled in the same manner.

SEC. 3. The board shall appoint a secretary of the board, who shall have charge of all books, maps, records, title deeds and papers, and documents of the board, and shall keep the minutes of all meetings of the board and executive committee, and shall prepare for printing and publication all bulletins, reports, circulars, rules, regulations, by-laws and other documents, ordered printed or published by the board. He shall cause to be made accurate maps of all tracts and parcels of the forest reserves, which maps shall be open to the inspection of any person desiring to inspect the same, but under such rules as the board may prescribe.

All such books, maps, records, title deeds and papers, and documents shall be kept in the office of the secretary, who shall also keep a record of the names and addresses of all beneficiaries under this act. The secretary shall keep a record of all warrants for the payment of money issued, and shall countersign each warrant which shall be signed by the president.

SEC. 4. No member of such board shall receive any pay for his services but shall be repaid actual reasonable expenses, incurred in attending meetings of the board or executive committee, or in performing services at the request of the board, or executive committee.

SEC. 5. The state treasurer is hereby required to act as the treasurer of the said board, and to keep accurate books of account of all money received and paid out for or on account of the said board or said "Forest Reserves," according to law and the by-laws of said board, and all funds appropriated for the use of the board, or which may in any way come to its use, disposal or control from the sale of timber or otherwise, shall be deposited with the said treasurer, and kept, and books and accounts of the same kept under the designated name of "Forest Reserve Fund," and there is hereby appropriated from any moneys in the state treasury not otherwise appropriated, the sum of one thousand (\$1,000) dollars, annually, to defray the reasonable, necessary expense of said "Forestry Board" in carrying out

the provisions of this act, which sum shall be credited to and be a part of said "Forest Reserve Fund." Said Forestry Board shall not be authorized to expend in any one (1) year any greater amount than the one thousand (\$1,000) dollars herein provided.

SEC. 6. The care, management and preservation of the Forest Reserves, and the forests thereon, as well as future growths thereon, and all moneys appropriated in that behalf, or collected therefrom in any way, and all personal property acquired to carry out the object of this act, are hereby confided to and vested in said Minnesota State Forestry Board, as the same may be herein, or in subsequent acts, defined and required.

The board shall observe, keep in view and so far as it can, ascertain the best methods of reforestation cut-over and denuded lands, foresting waste and other prairie lands, preventing destruction of forests by fire, the administering of forests on forestry principles, the encouragement of private owners in preserving and growing timber for commercial and manufacturing purposes, and the general conservation of the forest tracts around the head waters and on the watersheds of all the water courses of the state, and for these purposes to make reports of its doings, conclusions and recommendations to each session of the legislature, and from time to time publish, in a popular manner and print for popular distribution, in bulletin or other form, such of its conclusions and recommendations as may be of immediate public interest.

SEC. 7. The members of said board may choose a president and vice president annually, in January, or as soon thereafter as possible; may contract and be contracted with, in the name of the State of Minnesota, or in its behalf; adopt and use a seal, and alter the same at pleasure, and cause actions to be brought in the courts in the name of or in behalf of the state, to protect the state's interests in all matters confided to the board's care; a majority of the members shall constitute a quorum for the transaction of business and a less number may adjourn from time to time. The board may make all reasonable rules, regulations and by-laws for the government of its own meetings and actions, and for the conduct of its officers, agents and employes, and for the care, management, protection and preservation of the Forest Reserves and the forests thereon, and may appoint such needed agents, officers, attorneys and employes as it deems best.

The board may appoint an executive committee annually, on which it may confer authority to perform any executive act, and to exercise its judgment in minor details which cannot conveniently be acted upon by the board.

SEC. 8. The respective town boards of supervisors, and county commissioners are hereby constituted respectively, town and county

forest boards, which shall only have such pay for services, as shall be expressly authorized by the legislature, and which shall only perform such duties, have such authority, and exercise such powers, as may hereafter, herein, or in subsequent acts, amendatory or otherwise, be expressly conferred by the legislature.

SEC. 9. Any person or corporation being the owner in fee simple of any cut-over or denuded, or partially cut-over or partially denuded, natural forest lands, which will not probably be utilized for many years for agricultural purposes, or any bare or waste, or partially bare or waste, rough prairie lands, or any very sandy, very rough or very rocky lands, in this state, or any lands deemed absolutely necessary for the preservation of water courses (all to be determined by said state forestry board), may deed the same to the State of Minnesota for forestry purposes; all lands so deeded to the state for forestry purposes by any person or corporation are hereby forever dedicated for forestry purposes.

Before such deed shall be made and delivered, a proposition in writing shall be made by such owner or owners to said state forestry board to so deed the same for forestry purposes, under the terms of this act, and amendments thereof, made prior to such offer, and the question of the acceptance thereof shall be referred to the town or county forestry board where the land is situated (or both such town and county forestry boards) for its advice on the question of accepting the same; and said state forestry board, or its executive committee, may hear the person offering so to deed, or his or her representative, and also may hear such town or county forestry board or its representative, both sides in person or by written reasons submitted why such deed should or should not be received, and the decision of the state forestry board to receive or reject such offer and deed shall be final. Such deed may be made by quitclaim, when by the advice of the attorney general, or by the advice of its attorney, if said board have one, said lands are clear of liens except for taxes and tax sales still owned by the state.

When such deeds shall be so accepted by the board the lands thereby conveyed shall become a part of the Forest Reserves of the state.

SEC. 10. At least once in every five (5) years, and as much oftener as the state forestry board may decide, the accumulated income from each tract of land so deeded by the persons or corporations for state forestry purposes, shall be divided by the state forestry board and disposed of as follows, to-wit:

FIRST. One-third ($\frac{1}{3}$) shall belong to the state, to reimburse the state for the care and protection of the forests thereon, and for the non-payment of taxes thereon to the state, county and town, which

third ($\frac{1}{3}$) shall be divided between the state, county and town where the land is situated, as follows, to-wit:

One-half ($\frac{1}{2}$) to the state, one-fourth ($\frac{1}{4}$) to the county, and one fourth ($\frac{1}{4}$) to the town.

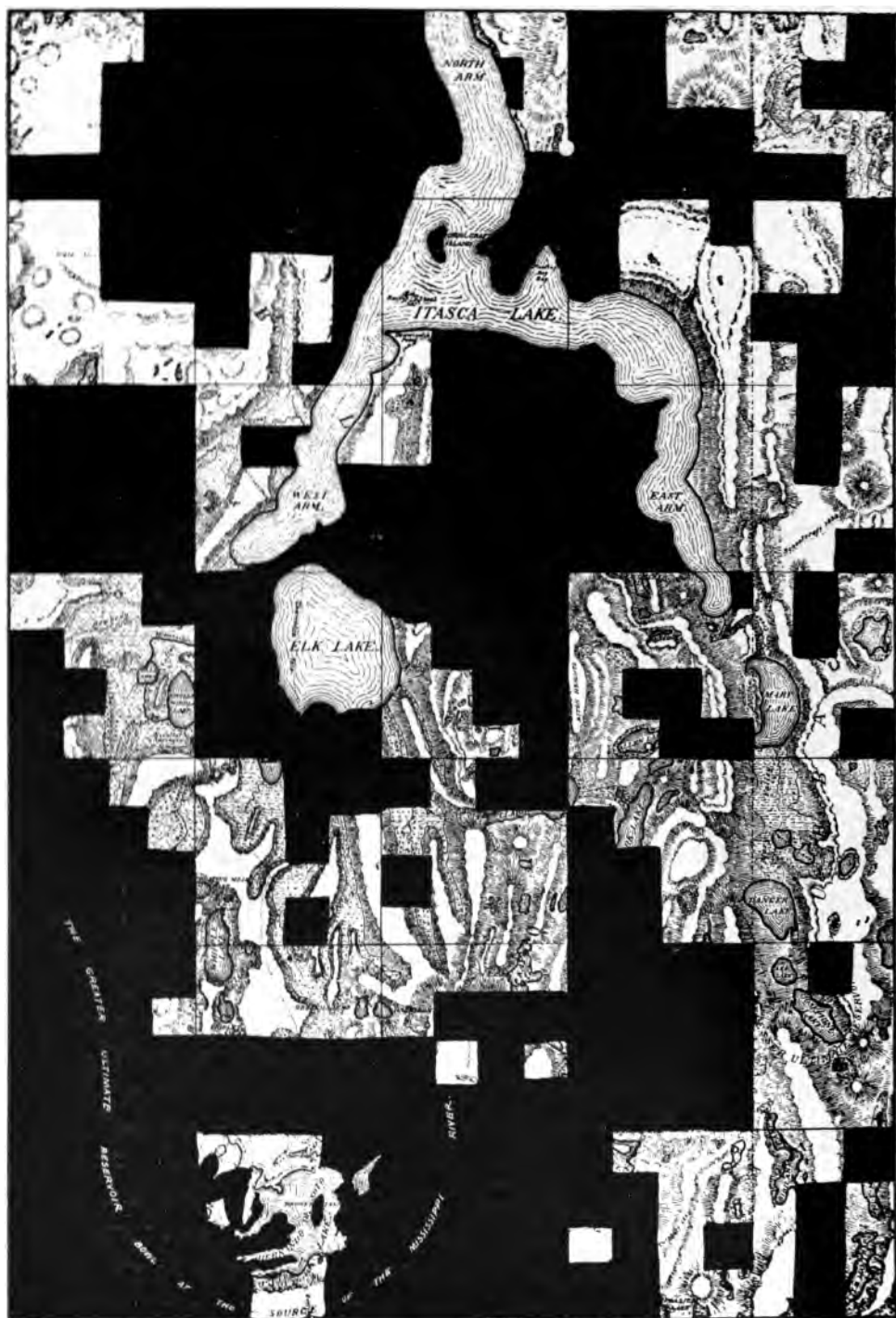
SECOND. Two-thirds ($\frac{2}{3}$) shall be paid to such public educational institution or system in the state as the grantor may designate in the deed of conveyance, or in a separate instrument executed as deeds of land are required to be executed and recorded in the office of the register of deeds of the county where the land is situated, or by will. But in case the grantor fails to so designate such institution or system, or if for any reason such institution or system fails to exist, then the same to be paid to the proper officer or officers, or boards for the benefit of the public school system of the state and the university of Minnesota, the public school system to have three fourths ($\frac{3}{4}$) thereof, and the said university to have one-fourth ($\frac{1}{4}$) thereof.

SEC. 11. The state, by and through said state forestry board, shall have full power and authority to lease for revenue, or for protection from fire, trespassers, or otherwise, low meadow tracts, or other tracts for pasture, when the same will not interfere with the growth of forest trees, and to sell dead and down timber, and mature timber, and to deed said tracts or parcels or parts of the same, where the growth of towns, the building of railroads, water power or other public improvements may demand alienation by the state, and said state forestry board may cause to be cut and sold, or sold with the right to cut and haul away forests or trees when said board may determine that the state's and the beneficiaries' interests will be subserved by so doing, but all proceeds of such sales or leases shall be divided as is the income therefrom as above provided.

SEC. 12. This act shall take effect and be in force from and after its passage.

Approved April 13, 1899.





Map of Itasca State Park. Tracts in white owned by private parties. (By courtesy of St. Paul Globe).

THE ITASCA STATE PARK.

In August I spent a day looking over the Itasca State Park in company with the superintendent, and walked several miles through thick primeval woods. I saw some handsome exclusively pine forest, also considerable forest of large leaved trees mixed with pine, balsam and spruce. Though not as rich in forest as some other localities in the State, it is yet well enough wooded to make a desirable park, aside from the interest attaching to it as containing the source of the Mississippi river. Evidently there is much wild game in its limits.

The only means of travel through the park at present is by boat. Its benefit to visitors would be very greatly promoted by the construction of paths and roads; and as soon as practicable the state should employ a landscape engineer to lay out and construct a system of roads and paths. Such improvements would add immensely to the attractiveness and value of the park. Towards this park Congress contributed as a gift 7,000 acres on condition that the State would protect the timber; and the only means for its protection from fire provided thus far, besides what the superintendent can do individually, is through the fire warden law. Another portion of the park, comprising 2,452 acres, was bought by the State of the Northern Pacific Railroad Company at fifty cents per acre.

The State is to be congratulated on the wise and fairly liberal action of the last legislature in appropriating \$20,000 to purchase timbered tracts within the boundaries of the park which still belong to private individuals and which, through lumbering, were liable soon to become denuded of forest cover and in a way to expose the rest of the park to serious danger from fires.

Chapter 303, of the General Laws of 1899, making the above mentioned \$20,000 appropriation, further provides that in case said appropriation shall become exhausted, and it shall transpire that timber is liable to be cut from any

land within the limits of the park, the attorney general shall endeavor to secure from the owner of such land an option to purchase the same, for a term not exceeding two years, which shall contain an agreement that the timber thereon shall remain undisturbed. He may pay for said option, if secured, a sum not exceeding four per centum per annum of such term, upon the value of said land as the same may be estimated by him. An appropriation of \$1,000 was made to enable him to secure such option.

CASS LAKE.

In my tour of inspection August last I took special pains to visit Cass lake, situated about two hundred miles northwest of Duluth, and found it to exceed my highest expectations in the beauty of its forest shores and availability for a health and pleasure resort. What attracted me particularly to Cass lake was hearing that the new Fosston extension railroad, running west from Duluth, as a part of the Great Northern system, passed through a very fine body of white pine near the lake; being the only considerable body of pure white pine adjacent to any railroad now left in the state except one in the eastern part of Carlton county, on the same road. I felt that it was desirable for the state to procure and hold as a park such a forest of white pine, near a railroad, while it was possible to do so. This body of white pine extends about two miles east and west by about a mile in breadth along the railroad near the south shore of Cass lake. Going straight north to Cass lake from the railroad the distance is not over a mile. Half a mile from the lake the forest changes from white to red (generally called Norway) pine in pure stand; that is, without mixture with any other sort of trees. The surface then begins and continues to slope very gently half a mile to the lake over an east and west extent of about two miles. (I am speaking now of the south shore, the only part I visited, but other parts of the shore are very fine.) The trees on the south shore have been growing about a hundred years, are tall



On the south shore of Cass Lake, looking west. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

and handsome, average a foot and a half in diameter breast high, and stand so thickly that a horse and buggy could not be driven through them. The soil is a sandy loam, the surface is free from underbrush and carpeted with pine needles. The clean, beautiful forest extends to within a step or two of the beach, which is of clean sand and just wide enough to be pleasant. There is not a weed or rush anywhere in sight. The water, which is remarkably pure, is shallow for a few hundred yards, making it an ideal place for bathing. The lake is ten miles long by eight miles wide, and contains two handsomely wooded islands, the larger of which is two miles across, and itself has a lake remarkable for its abundance of black bass. I have seen the most of the principal lakes in Minnesota, but have never yet seen any bordered with pine forest that could in any way match Cass lake for availability as a health and pleasure resort. Fir forest is especially healthy. Scientific men have ascertained that the air of such woods is richer in ozone than that of open country. Twenty-five per cent of the patients with incipient consumption who visit the Adirondack forests return cured. The state medical society should send a committee to visit Cass lake to report on its advantages and help mold public opinion so the legislature will make provision for the state buying a few thousand acres on the shore of the lake.¹ It all now belongs to the Chippewa Indians, and the government estimators of the timber now have their camps there in the midst of this beautiful south shore forest. They had dug a well, and I drank some of the water, which was cold and pure. These estimators were enthusiastic on the wonderful beauties of the place, and declared that it would be a shame to have the timber cut off. However, unless the state or the railroad company buys it to hold as a park, the timber land is liable to be sold in course of a year to lumbermen and the timber removed as soon thereafter as it suits the owner to cut it.

¹ This was written in August last. A committee of the State Medical societies visited Cass and Leech lakes during the following autumn.

Under the treaty it can only be sold in forty-acre tracts and to the highest bidder.

The president of Dartmouth college estimates that 30,000 people visit New Hampshire every year, attracted by its scenery, and who leave in the state about \$6,000,000 a year. Minnesota has no White mountains, but this Cass lake, with its thickly standing, clean and magnificent border of pine, is one of nature's gems, which probably, take it all in all, cannot be matched anywhere in our whole country. To cut the timber would simply ruin it for scenery and health. The state should buy it and manage it as a place of resort and rest for teachers and others who need the recreation it affords. What is everybody's business is nobody's business; and I fear this will not be done, unless people with influence wake up to the importance of very prompt and energetic action. I repeat—and I cannot emphasize the matter too much—that it would be simply wicked for the people of Minnesota to allow the south shore of Cass lake to be denuded of its forest. He would be a true benefactor who would buy the tract and donate it to the state for park purposes.

REPORT OF THE MEDICAL COMMITTEE.

The following is the report made, December, 1898, by a committee of the State Medical societies, which visited Cass and Leech lakes, on the subject of establishing a health resort in the pine woods, and addressed to the executive and legislative committees of said societies:

Your special committee appointed to investigate and report as to the feasibility of a state sanitary resort in the pine regions of Northern Minnesota beg leave to report as follows :

That they have given the matter careful consideration, and find with profound regret that the acreage of primeval pine accessible to the centers of population is so rapidly diminishing that any effort to secure a large tract thereof must be prompt and immediate.

The growing popularity and success of such forest reserves as those of New York, New Hampshire and Ontario afford ample precedent for prompt action on the part of our young and enterprising commonwealth.



Part of a dense forest of white pine through which the Great Northern Railroad (F extension) runs, just south of Cass Lake. Engineer's Camp. Photographed, August, 189 the Annual Report of the Chief Fire Warden of Minnesota.

Minnesota is peculiarly fortunate in having in the northern part of the state a most happy combination of sandy soil, pine timber and moderate elevation, thus affording ideal conditions for health resorts for the relief of consumptives, neurasthenics and all invalids in need of rest.

The efficiency or curative value of large tracts of coniferous forests in the cure of pulmonary affections has been fully demonstrated by the large percentage of cures in the Adirondack region and in the pine forests of Georgia. Such tract, if sufficiently extensive, could also be made available as a game preserve for such valuable game as are now native, but unfortunately being rapidly exterminated, or for such other game as might be introduced from time to time.

It could also be made the field of scientific forestry demonstration and an object lesson for future generations as well as the present one.

Your committee believes that now is the opportune time to secure such timber land, thus avoiding the large expenditure of money necessary later, the error of delay in the matter of expense being well exemplified in the greatly added cost of the Adirondack reserve.

Your committee, therefore, earnestly and unanimously recommends that the legislative committees of the state medical societies be requested to immediately call the attention of the governor-elect to this important subject in order that he may direct the attention of the legislature to the same. Your committee would also further suggest that the legislative committee consider this matter in detail at an early date and urge either state or national legislation, as may be deemed wisest, to secure the end in view.

H. H. KIMBALL, M. D.

PARKS RITCHIE, M. D.

THOMAS F. QUINBY, M. D.

W. S. LATON, M. D.

J. W. BELL, M. D.

E. L. MANN, M. D.

W. S. BRIGGS, M. D.

GEO. E. RICKER, M. D.

WILLIAM E. LEONARD, M. D.

Dated, Minneapolis, December, 1898.

UTILIZING OUR WASTE LANDS FOR FORESTRY PURPOSES.— DR. C. A. SCHENCK'S PLAN.

I do not expect that extensive forest planting will be soon undertaken in this state, but inasmuch as the imports of logs and lumber into the United States now average twenty-one million dollars a year in value, and considering

that it will take sixty to eighty years for a newly started forest on non-agricultural land to become merchantable timber, and bearing in mind that there is considerable of such land that has been forfeited to the state for taxes and yields no revenue but is deteriorating in value, it certainly does not seem premature to draw the attention of the public to the subject.

People make a great mistake who imagine that a forest is necessarily a vast inhospitable wilderness. The Black Forest (so called from the dark foliage of its coniferous trees) in Germany is 93 miles in length by 13 to 46 miles in breadth and abounds with villages and cities. It is traversed by railroads and good carriage roads. While there are solitudes on the high and rough land there are parts of it right in the midst of civilization. Writing of that portion of it near the city of Freudenstadt in Wurttemberg, Mr. Austin Cary, the well known Maine forester, says: "In five minutes' walk from the center of the city one could step into such fine woods as cannot be found in the whole state of Maine." So, if the project of planting or maintaining forest on some of the land in this state which is better adapted for timber production than field crops be undertaken, the people in the vicinity of such plantations need not fear that they will be shut out from the world. Any careful observer of land knows that in the same township will generally be found scattered areas of both good and poor soil. It is the object of forestry to utilize the poor soil; and when this is done one may expect to see in the same township villages, farms and forest. Besides, people living in the vicinity of well managed forests may count on having the benefit of good roads. They will also derive other benefits, because it has been well ascertained that the temperature of forests is a little cooler in summer and a little warmer in winter than that of open country. Forests are a barrier against hot winds from the south and cold winds from the north, they help to maintain water flow in streams, they enrich the soil on which they grow, they lend beauty to the land-

scape, and, being the basis of the lumber industry, they promote activity and wealth in the region where located.

There are in this state five million acres of vacant United States Government land. Including cut-over and other lands which, from being too hilly, too rocky, or too sandy are not available for agriculture, I assume that there are at least two million acres in scattered localities which are much better adapted for forestry than for agriculture. It is known that a large quantity of land—probably 200,000 acres—has been forfeited to the state for nonpayment of taxes. The most of such land may be supposed unfit for profitable agriculture. For the state to obtain absolute title thereto it would be only equitable that the state should pay to the towns and counties wherein it is situated any arrears of taxes due exclusively to such towns and counties. Such arrears would probably average twenty-five cents an acre. The inquiry arose in my mind how much richer our state would be at the end of sixty or eighty years from planting two million acres of this waste land to forest? I laid the matter before Dr. C. A. Schenck, superintendent of Mr. George W. Vanderbilt's forest at Biltmore, N. C., a very skilled and experienced forester (also assessor of forests of the Grand Duchy of Hesse-Darmstadt), and his valuable reply which I herewith submit shows that our state, by such an undertaking, would be seventy-two and a half million dollars richer! The total outlay would be \$42,400,000, including local taxes, and the net increase of wealth to the state at the end of eighty years would be thirty million dollars.

Dr. Schenck assumes that the land is to cost the state twenty-five cents an acre, and estimates that planting with pine on the large scale of 25,000 acres a year (which is less than is planted annually in Prussia), 5,000 plants per acre can be planted at \$11.25 per acre, to which add cost of land, 25 cents, makes \$11.50 per acre. This capital at two per cent compound interest will amount in eighty years to \$55.20. Meantime expenditures for taxes, protection and administration per acre will increase, at two per cent com-

pound interest, to \$9.70; which added to \$55.20 makes \$64.90 the cost of an acre of this forest at the end of eighty years. He estimates that the product per acre on average soil at the end of eighty years will be 12,000 feet, board measure, of the value of \$5.50 per thousand feet, equal to \$66 per acre, being equal to the capital invested, accumulated at two per cent compound interest. Continuously after eighty years the forest will yield annually on 25,000 acres a crop which can be cut of 12,000 feet board measure per acre, or 300,000,000 feet on the whole, worth at least \$1,650,000.

Dr. Schenck's statement is exceedingly clear and will be read with profit by every well wisher of our state.

SCHENCK'S PLAN FOR REFORESTATION OF WASTE LANDS IN
MINNESOTA.

BILTMORE, N. C., Nov. 10, 1898.

GEN. C. C. ANDREWS,

Chief Fire Warden, St. Paul, Minn.

DEAR SIR : Pursuant to your request expressed on October 20th and reiterated on October 28th, I beg to submit to you statement of the possibilities of planting up large areas of otherwise abandoned and barren land in the state of Minnesota. I have assumed that an area of two million acres is to be planted up in the course of the next eighty years, and that waste land may be acquired for an amount corresponding to the arrears of taxes thereon due to counties and towns.

EXPECTED EXPENSE OF AFFORESTATION PER ACRE.

Strong white pine seedlings two years old, nursery grown, as will be well adapted for the reforestation in question, can be raised at a price not to exceed \$1.25 per thousand. If raised on a large scale it is not impossible that the price will be reduced to one-half of the figure given.

Cleft planting—which means planting in small holes made with a narrow and long spade—should cost not more than \$1.00 per thousand white pine seedlings two years old.

Five thousand plants per acre will be ample and will allow of a considerable death rate in early youth, as is sure to occur, and at the same time will allow the selection of the fittest individuals to take place from a large number of plants.

Assuming that the figures above given are correct, the reforestation will cost \$11.25 per acre, to which must be added the price of the

land, estimated to be 25 cents per acre, making a total of \$11.50 per acre.

Figuring at 2 per cent compound interest and discounting \$11.50 for eighty years, the figure \$55.20 is reached as representing the cost of the original plantation, with compound interest on it accumulated, at the age of eighty years.

In the meantime, taxes on the land, the cost of protection and administration, which will certainly not amount to more than 5 cents per acre per year, if planting is done on a large scale, will add up, again with compound interest of 2 per cent, to the figure \$9.70. Adding \$9.70 to the figure of \$55.20 just given as representing the final cost of the planting per acre, we reach the figure \$64.90.

If the yield per acre after the lapse of eighty years is as much as \$64.90, the planting will have paid 2 per cent of compound interest.

EXPECTED YIELD PER ACRE.

The white pine tables published by Messrs. Pinchot and Graves, in 1896, show that a plantation of white pine eighty years old is likely to yield the following amounts of lumber, if the trees are used up to a diameter of the logs not less than 8 inches :

On first quality of soil,	-	-	24,200 feet B. M. per acre.
On average quality of soil,	-	-	12,000 feet B. M. per acre.
On third quality of soil,	-	-	3,700 feet B. M. per acre.

Assuming that the two million acres to be planted up have a soil corresponding with Pinchot's and Graves' average quality, which I think is a safe supposition, and further assuming that the stumpage of white pine land thus raised is worth \$5.50 per thousand feet B. M., the expected yield is worth \$66 per acre.

I am confident that this price of stumpage and the amount of lumber per acre given are perfectly obtainable, to say the least. In other words, the expected yield per acre will be such as to certainly pay 2 per cent of compound interest on the original cost of planting, taxes, protection and administration, which should not be more than \$64.90 per acre as shown above.

VALUE OF THE ENTIRE INVESTMENT AFTER EIGHTY YEARS.

If a plantation eighty years old is worth \$66.00 per acre, then a plantation—

70 years old is worth, discounting it at 2 per cent,	-	-	\$54.12
60 years old is worth, discounting it at 2 per cent,	-	-	44.22
50 years old is worth, discounting it at 2 per cent,	-	-	36.30
40 years old is worth, discounting it at 2 per cent,	-	-	29.70
30 years old is worth, discounting it at 2 per cent,	-	-	24.42
20 years old is worth, discounting it at 2 per cent,	-	-	20.13
10 years old is worth, discounting it at 2 per cent,	-	-	16.50

If we plant for eighty years in every decade of years 250,000 acres, we shall have at the end of that period an area of two million acres covered with forest growth of different age classes—in fact of ideal arrangement of age classes, allowing the forester to cut 25,000 acres of mature timber annually thereafter.

The forest will consist of the following areas:

250,000 acres worth about \$66.00 per acre, making a total of 16.5 million dollars.

250,000 acres worth about \$54.00 per acre, making a total of 13.5 million dollars.

250,000 acres worth about \$44.00 per acre, making a total of 11.0 million dollars.

250,000 acres worth about \$36.00 per acre, making a total of 9.0 million dollars.

250,000 acres worth about \$30.00 per acre, making a total of 7.5 million dollars.

250,000 acres worth about \$24.00 per acre, making a total of 6.0 million dollars.

250,000 acres worth about \$20.00 per acre, making a total of 5.0 million dollars.

250,000 acres worth about \$16.00 per acre, making a total of 4.0 million dollars.

The entire area of two million acres will bear an aggregate value of stumpage amounting to 72½ million dollars.

AGGREGATE ANNUAL OUTLAY.

The expense for two million acres of land at 25 cents per acre will be \$500,000.

Annual expense for planting 25,000 acres at \$11.25 will be \$281,250.

Besides for taxes, protection and administration on an average area of one million acres—assuming that the two million acres will be acquired gradually—these expenses to be 5 cents per acre, must be spent annually \$50,000.

Thus, at an annual expense of say \$350,000 per year the state will own forest property worth 72½ million dollars after the lapse of eighty years.

RETURNS AFTER EIGHTY YEARS.

From the eightieth year on the forest will yield annually, on 25,000 acres, 12,000 feet B. M. per acre or 300,000,000 feet B. M. on the whole, worth at least \$1,650,000, figuring at a stumpage value of \$5.50.

It is very likely that a considerable yield from thinnings will be obtained at the same time. Under proper care, a second growth will be secured, in the place of the one planted, free of charge, from self-sown seed.

If the increase of lumber prices holds pace with the increase of population ($1\frac{1}{2}$ per cent per annum) the result will be 3.3 times better than shown above. The investment will then yield $3\frac{1}{2}$ per cent of annual interest instead of 2 per cent.

It is worth mentioning perhaps that the exclusive right of fishing and hunting on say 25,000-acre sections of the forest leased out periodically under certain restrictions will yield a considerable return as well.

To protect fish and game whilst protecting the forest will be an additional duty of the staff of forest rangers. The combination of forest rangers and game keepers is even from a financial standpoint a most desirable one.

SOME HINTS FOR THE PLANTER.

The planting, to begin with, should be made in a way safe-guarding the future forest against damage from fire, storms and insects. As large, even aged, forests suffer from these factors in a high degree, the reforestation should be made in strips, say 500 feet wide. The best soil should be planted up first so as to obtain early returns and so as to secure the necessary training of the crew of planters and of the superintendence of the rangers before more difficult tasks are begun on poorer soil.

The planting should proceed gradually toward the prevailing storm direction, so that after eighty years the plantations would lie about as follows :



The figures given in this sketch represent the age of the strip of forest. Every two series of such strips are separated by what may be called fire lanes.

Under this arrangement the storm will not blow down any trees.

Between every two strips, lines about 16 feet wide should be left unplanted as secondary fire lines. They should be kept cleared from inflammable matter as much as possible, so as to act as secondary fire lines and so as to facilitate supervision and transportation of forest produce. The main fire lanes, separating two series of forest plantations should be about 100 feet wide. They should be established at intervals of about 2,500 feet and should be kept absolutely clean from any inflammable matter, being burned over annually under proper supervision by the forest rangers.

This arrangement will necessitate each series of plantations to have a width of about 2,500 feet or to consist of about five strips each.

Adjoining strips should differ in age by at least five years and by not over twenty years, so as to avoid the spread of insect pests and fungus disease on one side and heavy overshadowing on the other side.

Seedlings and saplings of pine, tamarack, white cedar and hard woods, wherever they appear in groups sprung up from self-sown seed, should be fostered, whilst single individuals—especially misshaped and shrubby trees—should be gradually removed by deadening or otherwise.

A good survey must precede the entire operations. Without the help of accurate maps, forestry work is uncontrollable.

Only compact bodies of land should be acquired, the cost of protection and administration per acre being much smaller in this case.

HOW TO OBTAIN THE NECESSARY FUNDS.

The state will be entirely justified in securing the moneys necessary for the acquisition and the reforestation of land by public loans. Even part of the interest (certainly 2 per cent) due on such loans may be secured by loans. The increase of the loans, to be made annually, will go hand in hand with the growth and the extension of the forests.

The loans, backed by valuable assets, viz., the forests, will be obtainable at a comparatively low rate of interest. From the eightieth year on the net revenue from the forest is likely to yield sufficient interest on the entire investment.

From the sixtieth year on mature timber may be obtained from the best localities, yielding then (after Pinchot and Graves) 13,400 feet B. M. per acre. Inasmuch as the expense for acquisition and reforestation, administration and taxes is not made from loans, the forests will form the "Savings Box of the Commonwealth."



A very rich body of White Pine Forest, half a mile south of Cass Lake, Minn., along Duluth, Superior & Western R. R. Photographed for the Annual Report of the Chief Fire Warden of Minnesota, August, 1898.



Norway Pine Forest on south shore of Cass Lake. United States timber estimator's camp. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



ADVANTAGE OF THE STATE FOREST SYSTEM THUS SECURED.

The advantages of such a system of forestry are manifold.

First: All the sums spent for planting are money spent for common labor. The value of the plants too is nothing but money spent for gathering seeds, preparing nurseries, sowing seeds, weeding seed beds, etc., etc.—consequently nothing but money distributed amongst the laboring people.

Second: The common laborer engaged in forest planting finds work at the season at which labor is not required in agriculture, building, etc.

Third: The harvesting and the manufacturing of wood and lumber will be a source of revenue to a large population after another two generations, such revenue being derived from lands otherwise barren.

Fourth: The public loans above mentioned will offer a good chance for safe investments. History proves that investments in forestry are safer than any other.

Fifth: The fishing and hunting interests of the state will be greatly benefited by the forests systematically protected and used.

Sixth: The example given by the state will act as a stimulus relative to conservative use of forest resources by the wood owners.

Seventh: The counties will obtain taxes from land otherwise barren. Personally, I am strongly in favor of the state paying taxes on state forests to the counties and towns where such forests are situated. Of course these taxes should be taxes on the value of the soil *only*, just as in the case of agriculture, and not taxes on soil plus crop. This so much more as an immature crop has practically no market value and as revenue cannot be derived from it immediately.

For these reasons I have included taxes on the land amongst the expenses in the calculations at the head of this letter.

POSSIBILITIES OF THE SPECULATION.

As regards the possibility of higher returns than those figured out to begin with, they may be expected with certainty.

A. If plenty of young healthy seedlings of valuable species are found growing on part of the area to be acquired. Every 1,000 seedlings thus found will save an expense of about \$2.25.

B. If part of the land is of so good a quality that less than 5,000 seedlings per acre will be deemed sufficient for the formation of a forest.

C. If cheap labor (children) can be used for part of the nursery work and for part of the planters' work. At Biltmore the clefts in which the roots of the seedlings are imbedded are made by men, whilst the plants are inserted into the clefts by boys. Even on steep

slopes and on clay soil, one man and one boy will plant 1,800 plants per day.

D. If the lumber prices and the facilities for transporting logs and lumber are increased in the course of the years. A change of conditions in that direction will also allow of a larger output of lumber, as logs having a diameter of less than 8 inches at the small end will be utilized to good advantage if the prices of logs and lumber are higher and if the freight charges are lower.

Under these circumstances the yield from thinnings will become valuable as well, especially on the better soil classes.

I consider the subject of reforesting waste lands in the state of Minnesota of paramount importance for the commonwealth for reasons which I need not explain to you.

I sincerely hope that your endeavors will be successful and it will give me great pleasure to give you any possible assistance.

Faithfully yours,

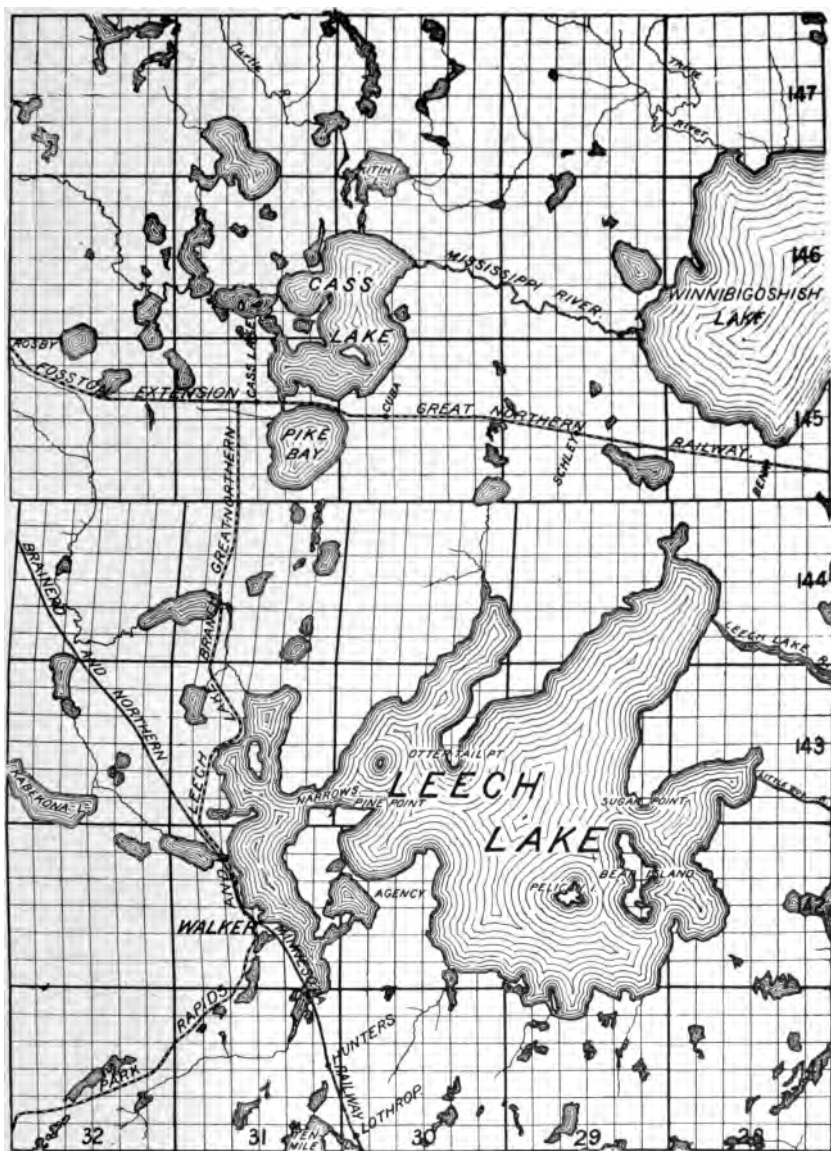
C. A. SCHENCK.

What is striking about this or any other plan of forestry is the remoteness of the profits. It is impressive, indeed, when people will sit down to calculate the returns that can accrue from the soil at the end of so long a period as eighty years! I would not exchange such a generation for one that went wild with schemes like Mississippi and Darien.

Of course there should be no haste in this matter; but it is the business of the statesman to study the wealth of nations; and one of the facts that may well arrest his attention is that whereas England and France together last year imported lumber and wood of the value of \$140 000,000, the United States were able to furnish but a small part of that amount, our total exports of lumber to all countries being but \$26,000,000; and if we continue to exhaust our forest capital as we are now doing, without any effort for forest reproduction, our ability to export lumber will yearly become less and less.

SOME FORESTRY FACTS AND PRINCIPLES.

The value of the pine, just as it stands, that is cut in Minnesota in a single winter, in a favorable business year, is \$5,000,000; when sawed into lumber at the mills, its value



MAP OF THE CASS AND LEECH LAKE REGION, MINN.



will have increased to \$10,000,000, of which increase 80 per cent, or \$4 000,000, represents labor; when further manufactured and worked up in various forms its value becomes multiplied. This partly illustrates the value of our forests as an industrial resource. The friends of forestry do not interfere with the cutting and marketing of timber. On the contrary, they wish the industry to be continuous, and a great step in making it continuous is the prevention of forest fires, thereby promoting the natural reproduction of forest on cut-over land. The friends of forestry concede that the private owners of pine land have a right to, and for their financial success must, cut and sell their pine whenever they can find a good market for it. If there are forest areas which the public needs to have kept as forest—for example, at the head waters of rivers to help maintain water flow, or near some beautiful lake for scenery and health—then the public must buy it. The private owners cannot be despoiled of it without remuneration. No! the friends of forestry do not interfere in any way with the rights of lumbermen and owners of timber land.

Many of the countries of Europe derive a good share of their prosperity from forestry. In Germany 1,000,000 people are supported by forestry, and 2,000,000 more by manufactures of which forest products form the principal material. The little Duchy of Baden, not as large as Pine county in this state, derives a net annual revenue of \$667,000 from its 240,000 acres of public forest. The Kingdom of Wurtemberg, only a very little larger than our county of St. Louis, derives a net annual revenue of \$1,700,000 from its 418,000 acres of public forest.

The Kingdom of Saxony—which leads all other countries in forestry—from its 430,000 acres of mostly spruce forest, and mostly on poor mountain land, derives an annual net income of \$1,900,000, being \$4.50 per acre. And she is not exhausting her forests. On the contrary, her forests are worth double to-day what they were forty years ago.

The forests of all these countries are not only profitable in a money sense, but they are provided with good roads, are well guarded, are delightful resorts, and not the slightest impediment to the settlement and cultivation of neighboring agricultural lands.

LEADING PRINCIPLES OF FORESTRY.

Some of the leading principles of forestry ought to be and easily can be understood by people generally. One of these principles is that the best agricultural land should not be devoted to forest; but that forest should be grown on land that is either too hilly, too rocky or too sandy and light for profitable agriculture. One of the great economic advantages—one of the great beauties so to speak—of forestry is that wood and timber can be profitably grown on soil that is unfit for farming purposes. The forest, by the leaves it sheds, continually enriches the soil; whereas, field crops exhaust it. Let this principle be remembered, that forest is not to appropriate good agricultural land. Wherever there is land now occupied by forest that is well suited to raise field crops it is expected that such land will finally be cleared and used for agriculture. It is, however, a fact, as has been shown by the experience of farmers in the older states, that much forest land is often cleared and put into field crops which is altogether too light and unfit for agriculture, but which, if left in forest, would continue to yield a good income. Farmers before clearing woodland should dig into and examine the soil. They should look ahead and remember that there is going to be a continually increasing demand for timber.

Another principle in forestry is that the forest must be continuous; that it should always furnish a sustained yield; that no more timber should be taken out of it in a year or in a series of ten or twenty years than grows in the entire forest the same period; so that in a hundred years hence as much can be cut in a year as can now be cut in a year.

The forest is to be treated as an inviolable capital and only the interest or income taken from it. Let us take this simple illustration: Suppose one owns 2,000 acres of pine forest which he wishes to maintain as a perpetual income-yielding forest property; he will, according to forest principles, cut on an average only 20 acres a year, taking the ripest and largest trees, and so as to promote reproduction on the cleared land by natural seeding from trees left standing. But if for a series of years the market for lumber is very favorable he may cut a good deal more than 20 acres per year; then, in a series of years of poor market, he probably will not cut any, but he will manage so that for a long period his cuttings will average 20 acres a year. At the end of 100 years' rotation the 2,000 acres will have been all cut, and whoever has the forest then will resume the cutting on the 20 acres that were first cut, and which by that time will have grown to large size. This explains briefly the method of maintaining continuous and regular forest revenue, which is the fundamental principle of forestry. It is well to notice here a great advantage which the forest crop has over the wheat or any other field crop. The latter must always be harvested and marketed when ripe, however poor the market may be, but a forest crop can be left continually growing till the market is favorable.

Another principle of forestry is that the cutting of timber should be in blocks or strips so as to facilitate reproduction of timber on the cleared areas by seeds falling from the trees left standing. This is a more economical way of reforesting than by artificial sowing or planting. Sometimes, however, there is need of artificial help in preparing the land for the seed or in planting or sowing here and there a patch to effect a sufficiently dense growth.

Another principle is that a forest when young must have, in numbers, vastly more trees than when it is mature. A tree grown in the open may be handsome and useful for shade, but it is useless for timber. To make good timber,

a forest, when young, must be crowded so as to secure height growth. In such situation there is a survival of the fittest. A struggle—a continual battle—goes on for supremacy, just about as in a human life. The weak ones succumb and perish; the strong ones tower aloft. In dense young forests the trees shed their branches or scarcely have any except near the top, and there is a lofty height growth of clear timber. A piece of mixed woods, managed on forestry principles in the Black Forest of Germany, has per acre at the age of 20 years, 3,960 trees; at the age of 40 years, 1,013 trees; at the age of 60 years, 449 trees; at the age of 80 years, 346 trees; at the age of 100 years, 262 trees. The decrease is sometimes partly effected by artificial thinning.

The fact is recognized that the most of the pine forest in Minnesota is now owned by private parties, who must, for their financial success, cut and sell their timber just as fast as they find a good market for it. In frequent cases they have built branch railroads into their forests, which they must take up as soon as the cutting and hauling are done. Hence they cut clean, even though some of the trees are not more than a third part grown. The practice is sometimes different in pineries bordering water courses, which afford a permanent cheap means of getting the logs to mill. In such pineries the proprietor can leave the younger trees to grow, and he can come back for them after an interval of some years. With the magnificent remnants of primeval pine the state has nothing to do except to aid in preventing its destruction by fires (and which in honor it is bound to do, since the pine land owners pay taxes for the protection of their property); or possibly the state should, before it is too late, buy and hold a few tracts of this virgin pine for parks.

Our best white pines have been growing from 100 to 300 years; and although merchantable pine, but not of the best quality, may be grown in 60 years, there are but very few individuals willing to wait so long for a crop; and if anything

important is to be done to renew and perpetuate our forest wealth, it must be done by the state, or through the inducement it offers through the reduction of taxes or in some other form.

It is more profitable to raise forest from natural seeding, but where land has been entirely cleared, forest of pine and spruce can be renewed only by artificial planting or sowing. There are in Minnesota several million acres of waste land unfit for agriculture, and now totally useless, but which might be made to yield a rich revenue to the state if planted with forest.

FORESTRY IN EUROPE.

Through the courtesy, hereby thankfully acknowledged, of the governments of Austria and Saxony, this office was furnished the past year with very valuable information in regard to the extent and management of forests in those countries. This, together with information procured from other European countries whose forest administration takes high rank, enables me now to give, by repeating some of the papers in my previous report, a more comprehensive, concise, practical and fresh account of European Forestry than has heretofore been published in this country. The list embraces in alphabetical order the following separate states:

Alsace-Lorraine.
Austria.
Baden.
Bavaria.
France.
Hesse-Darmstadt.
Norway.

Prussia.
Sax-Meiningen.
Saxony.
Sax-Weimar.
Sweden.
Switzerland.
Wurtemberg.

ALSACE-LORRAINE.

STATE FORESTS.

Aggregate extent 338,500 acres, situated in the valleys of the Rhine and Mosel Rivers and on the Vosges mountains. The prevailing kinds of trees are fir (*abies pectinata*), spruce (*picea excelsa*), pine (*pinus sylvestris*), oak and beech. The average estimated value per acre is about \$100. Annual aggregate expense of administration \$862,000; annual aggregate revenue \$1,712,000. Average net profit per acre, \$2.50. The number of acres annually sown with seeds, 610; planted with seedlings, 1,250 acres. On 2,750 acres the surface of the ground is roughly opened with spade, plow, harrow or hoe with a view to facilitate the germination of self sown seeds. On about 50 per cent. of the entire area, reforestation is effected by self sown seed, from standing trees; on about 35 per cent. of the entire area, planting trees and on about 15 per cent. planting seeds is resorted to.

There is a continuity of forest produce. The annual yield or cutting of the forest is not allowed to exceed the annual production. A decrease of the growing stock, by over cutting the forest, would be considered a criminal offense on the side of the forest administration. The general increase of the productiveness of the forest, however, permits of a gradually, but slightly, increased annual output. The forests consist of more or less averaged sections termed "compartments." Every compartment yields periodically (say in the 50th, 70th and 90th year of the tree life) a certain "intermediate yield," composed of immature trees, removed by way of thinnings. When the remaining trees reach financial maturity, they are removed either by a clean sweep or gradually, the removal proceeding hand in hand with the development of the second growth started underneath the mature trees (fir and beech).

The cutting of forests, with a view of using the soil for agriculture or pasture thereafter, is strictly prohibited since 1803, unless, under certain stated conditions, permission to the contrary effect is granted by the civil government. Any forest ground cleared from tree growth must be planted up within three years after such clearing, if in the opinion of the forest administration regeneration from self-sown seeds cannot be depended upon. The owner of unproductive lands, when proposing to plant such lands to forest, receives certain contributions out of the treasury of the state. Plantations made on the tops and on the steep slopes of mountains, also plantations made on dunes and on unproductive prairies densely clothed with ligneous weeds, are free from taxes for 30 years. The amount of damage annually caused by forest fires is very little; no data available. The principal cause of such fires, when they do occur, is the careless use of matches and cigars thrown away burning. Very few such fires are annually caused by railroad locomotives; no data available. It may be estimated that in Alsace-Lorraine, as in Prussia, 10 per cent. of all forest fires are caused by sparks from locomotives.

The forest service is entirely co-ordinate and equal to the other branches of the public service. The average salary per annum of the "Land Forst Meister" (forest councillor) is \$2,000; of the "Forst Meister" \$1,500; of the "Oberforster" (district manager) \$830; and the allowance for office and traveling expenses of each officer is \$500. All forest officers have the use of an unfurnished house free of charge. "Additions to the forestry statistics of Alsace-Lorraine" are published annually by the secretary for Alsace-Lorraine department of Finance, Agriculture and Government Lands. Twelve bulletins have been issued so far. Four periodicals bearing on forestry are published.

PRIVATE FORESTS.

The aggregate extent of private forests is 771,000 acres; of which 546,000 acres are managed on forestry principles, being owned by towns, villages or public institutions. The forests owned by private individuals proper, aggregating 225,000 acres, are managed at the will of the owner except as above stated. The average value per acre is uncertain; it depends on growing stock, accessibility, quality of soil, etc. However, the average value of the private forests may be roughly estimated at 75 dollars per acre. The average annual rate of net income is between one and one-half and four per cent. The total forest product of Alsace-Lorraine is well sustained. The municipal forests yield 70 cubic feet per acre per annum. This quantity is equivalent to about 140 feet of lumber, board measure, and one half a cord of fuel. The population of Alsace-Lorraine is 1,605,000. The area of the entire territory is 3,625,000 acres, of which 1,110,950 acres are under forest. The annual yield of raw material is $61.1\frac{1}{2}$ cubic feet per acre. Of this amount 40 per cent consists of timber, and 60 per cent of fuel, corresponding with about 170 feet timber, board measure, and four-tenths cord of fuel. The cost of cutting timber and fuel, inclusive of sawing into logs, piling along wood roads, etc., amounts to one and one-tenth cents per cubic foot. At this price, the workmen earn 43 cents per day. The value of timber, dragged to forest roads, is $9\frac{1}{2}$ cents per cubic foot, on an average. The value of fuel, piled up along roads, is three and four-fifths cents per cubic foot, or about \$3.42 per cord. The stumpage of timber is worth about \$12.00 per 1,000 feet board measure. In the state forests about \$80,000 are spent annually for road improvement and forest railroads. The exclusive right of hunting is periodically leased to the highest bidder, under certain restrictions. These leases yield annually about 4 cents per acre. In the season of 1893-1894, for instance, there were killed



Remnant of the magnificent white pine forest which covered an extensive area, including the site of the present town of Hibbing. Soil, red loam with some clay. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

in certain districts aggregating 320,000 acres 42 head of red deer, 451 head of roe deer, 175 head of wild boar, 2,555 hares and 24 capercalsey (mountain cock), besides a number of minor animals.

AUSTRIA.

STATE FORESTS.

The entire area under forest administration controlled by the Austrian state comprises 1,782,169 acres. The following table will show the several owners of the area thus controlled and managed by the state, giving at the same time under the different headings the use (forest, field, pasture, etc.) which is made of the area:

	AREA OWNED BY					
	State.	Roman Church.	Universities and Schools.	Charity Funds.	Greek Church.	Total area.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Forest	1,766,036	231,673	8,140	6,143	561,948	2,573,940
Fields, meadows, gardens	23,429	19,863	894	1,581	52,187	97,954
Alpine pasture land	143,220	17,471	2,090	114	50,398	213,293
Miscellaneous uses	33,899	885	34	25	133	34,946
Total of the productive area	1,966,554	269,892	11,158	7,863	664,666	2,920,133
Unproductive area	795,215	63,067	712	190	3,052	862,236
Grand Total	2,761,769	332,959	11,870	8,053	667,718	3,782,369

It appears from this tabular statement that the forests administered by the Government occupy an area of 2,573,940 acres, or 10.7 per cent of the entire forest area of Austria, being 23,993 442 acres. The Royal and Imperial Secretary of Agriculture at Vienna, under whom there is a

department of forestry for the administration of lands owned by the state, church, schools, etc., is entrusted with the administration of the entire area shown on the above statement with the exception of a few lots serving special purposes, which need not be mentioned here. Under the Department of Forestry there are eight territorial offices, and under these eight territorial offices there are 186 local offices. The largest area under the supervision of a single territorial officer is 628,225 acres; the smallest area under the supervision of a territorial officer is 191,498 acres, whilst the average is 452,762 acres.

Including unproductive soil a local range comprises in one case as much as 120,726 acres. If only the productive forest area is drawn into calculation, the maximum size of a local range is 58.993 acres, whilst the minimum is only 1,030 acres. The average size of the forest area under the management of a single local officer is 13,880 acres.

There are two distinct groups of forests administered by the state authorities—one in the east, comprising lands in Galizia and Bukowina, and one in the west, comprising the Alps. Besides, there are some smaller forests lying in the southern and the northern sections of the empire.

The eastern group is situated between the forty-seventh and fiftieth degrees of northern latitude and the forty-fourth and thirty-eighth degrees of eastern longitude (ferro); the western group is found between the forty-sixth and forty-eighth degrees of northern latitude, and between the twenty-eighth and thirty-fourth degrees of eastern longitude. The smaller forests in the north and south, just mentioned, reach the forty-third degree of latitude in the south and the fiftieth degree of latitude in the north.

The area owned by public institutions (church, universities, schools, charity funds), which hereafter will be termed "fund forests," are scattered between the forests owned by the state itself. Very often state forests and fund forests are allotted to the same local range. It is only in the

extreme east of the monarchy that there are found large areas consisting of fund forests only, namely, those belonging to the religious fund mentioned in the above statement in column 6 as "Greek Church," more properly called the "Greek Oriental Fund for Religious Purposes in the Bukowina."

All further details may be taken from the map. As regards the elevation at which the Austrian state and fund forests are found, it may be said that 2.6 per cent are lying below 300 meters (or 984.3 feet) elevation, 14.1 per cent between 300 meters (or 984.3 feet) and 600 meters (or 1,968.6 feet), 27.7 per cent between 600 meters (or 1,968.6 feet) and 1,000 meters (or 3,281 feet), 42.4 per cent between 1,000 meters (or 3,281 feet) and 1,500 meters (or 4,921.5 feet), and 13.2 per cent above 1,500 meters (or 4,921.5 feet). The main mountain range in the east consists of the Karpath stock, lying west of the Alps. It appears that the majority of the state and fund forests are found at an elevation exceeding 1,000 meters (or 3,281 feet), or at the headwaters of the streams. Hence they are of paramount influence on the climate and on the water supply of the adjacent territory.

It may be added that:

1. Twenty-six per cent of the state and fund forests are lying in the plains and at the foot hills.
2. Forty-nine per cent of them are lying in the mountains, at medium elevations, growing under conditions favorable to tree growth.
3. Twenty-five per cent of them are lying in the highest mountain region, extending up to the limit of tree growth.

The general topographical character of the Austrian state and fund forests is very variable, changing from the level plain to the very steepest declivities. The climate on the whole moderate. The quickest change of temperature takes place in the highest mountains and in the plains north of the Karpath mountains.

The annual mean temperature is highest in the forests of southern Dalmatia, between the forty-second and forty-third degrees of northern latitude, namely, 17.0 degrees celsius. Here the mean minimum temperature is minus 0.9 degrees celsius. The lowest mean annual temperature is found in the high mountains, at an elevation of 2,040 meters (or 6,693.24 feet), in the Alps of Kärnthen, namely, 0.6 degrees celsius. In this case the mean annual minimum is minus 21 degrees celsius. At an elevation of 1,600 meters (or 5,249.6 feet) above sea level, on the Schneekoppe, in the Riesen mountains, Bohemia, the mean annual temperature is 0.4 degrees celsius, the mean minimum being minus 33.7 degrees celsius. In the Alps the line of eternal snow lies above 2,700 meters (or 8,858.7 feet); in the Karpath mountains, above 2,460 meters (or 8,071.26 feet).

The precipitations are largest in the Alps, in the Bohemian mountains, in the Karpath mountains; smallest on the plateau of the Karst in Dalmatia and Istria. The average annual rainfall within the zone having rain during summer (in the central Alps) is 1,151 millimeters (or 45.315 inches); in the sub-Alps it is 1,008 millimeters (or 39.685 inches); in the northwestern part of the monarchy, 664 millimeters (or 26.142 inches); in the Karpath mountains, 732 millimeters (or 28.819 inches; in the zone of prevailing fall precipitations (i. e. in the territory adjoining the Mediterranean sea) the average annual rainfall amounts to 1,185 millimeters (or 46.654 inches).

The soil consists in the central Alps of crystalline slates joined towards north by a chain of silur and devon formation. On the southern margin of the Gneis mountains, and those consisting of syenite and granite, there is found red porphyry surrounded by red sandstone and dolomite. The northern Kalk Alps consist of shell and jura (limestone). The southern Kalk Alps show isolated sections of cretaceous formation. In the Karst mountains there are found

earlier calcareous formations, here and there interrupted by sandstone. The Hercynian mountains, in the north-west, consist of granite mixed with silicious slates dotted with a few basalt cones. The Karpath mountains contain a central range formed of transition rock, whilst their outskirts consist of sandstone, chalk and marlestone. The disintegration of the above named geological formations furnishes soil well adapted to forestry if the proper species is selected for the proper place.

The species covering most ground is the European spruce (*Picea excelsa*), occupying 49 per cent of the entire forest area. Beech is next, occupying 20 per cent. Then follows the fir, occupying 19 per cent, and the tamarack, occupying 5 per cent. A small area only is in possession of the pines (only 3 per cent). The balance of 4 per cent is occupied by alder, linden, maple, oaks, elms, aspens, willows, etc. It appears from these figures that the Austrian state and fund forests consist of coniferous woods to the amount of three-quarters and of hard woods to the amount of one-quarter.

In the Alps spruce reaches up to an elevation of 2,000 meters (or 6,562 feet), and in the Karpath mountains to an elevation of 1,500 meters (or 4,921.5 feet). It forms, especially on the high mountain ranges, pure forests in many cases. However, it is often found mixed with other conifers and with hard woods. In the very highest mountains it shows a poor growth, short boles and bad form, the diameter increasing rapidly from the root to the top. The branches are running down to the ground and are covered with lichens. Spruce thrives best on slightly sloping ground protected from high winds, where the underlying ground is a sandy loam formed from slate. Here the tree shows long, straight and clean boles. However spruce is found thriving in almost all situations.

Silver fir (*Abies pectinata* D. C.) is mostly found mingled with beech and horn-beam and spruce. It does not run as

high up in the mountains as the spruce will do. However, it is found in the Karpath mountains at an elevation of over 1,500 meters (or 4,921.5 feet). Pure forests of fir are found only in a few places (Vienna forest, Karpath mountains and Krain).

Larch (*Larix Europæa* D. C.) is scarcely ever found forming pure forests. Its favorite ground is an eastern and northern slope where spruce is the predominating species. Under these conditions it rises as high up as 2,200 meters (or 7,218.2 feet). Larch is thriving splendidly on calcareous and sandy loam, especially on well shaded slopes. Larch avoids wet, sunny, and such localities which are exposed to rough winds.

Scotch pine (*Pinus sylvestris* L.) is found in the Alps and in some dry and poor localities elsewhere. It is running up to an altitude as high as 1,200 meters (or 3,937.2 feet, in southern Tyrol even as high as 1,700 meters (or 5,577.7 feet), here attaining the size of a dwarf only. In the sandy plains of Galizia Scotch pine shows a good growth and furnishes fine timber.

The black pine (*Pinus Austriaca* Höss) is very scarce on the whole. On the south slopes of the Vienna mountains it forms small forests. It is fond of the sunny side and of calcareous ground.

Cambran pine (*Pinus Cembra* L.) is a tree of the high Alps. It thrives best between 1,500 meters (or 4,921.5 feet) and 1,800 meters (or 5,905.8 feet) elevation, rising up to 2,400 meters (or 7,874.4 feet). Its favorite stand seems to consist of a deep loam formed by the disintegration of slate. It is never found on calcareous ground.

Mountain pine (*Pinus Pumilio* H. K.), or dwarf pine, forms the uppermost fringe of the forests in the Alps.

The following species of pine are found besides the above named: *Pinus uncinata*, *Pinus halepensis*, *Pinus Pinea* L. The common juniper (*Juniperus communis* L.

and some other species of the same genus are found here and there.

Beech (*Fagus sylvatica* L.) occupies more ground than any other hard wood. It forms dense forests up to an elevation of 1,500 meters (or 4,291.5 feet), and at an elevation of 1,800 meters (or 5,905.8 feet) it still appears as a bush.

The oak (*Quercus*) occupies only 1½ per cent of the entire forest area. It forms pure forests here and there in the plains and in the foothill region. The following species of oak are found in the Austrian State and Fund forests: *Qu. pedunculata*, *Qu. Robur* W., *Q. Cerris* L., *Qu. pubescens* W., *Qu. ilex* L., *Qu. Suber* L., *Qu. coccifera* L., the four first-named species being more frequent than the three last-named ones.

The following shows the other hard woods found: Alders: *Alnus glutinosa* Grt., *A. incana* D. C., *A. viridis* D. C. Birches: *Betula alba* L. and *B. nana* L. Aspen: *Populus tremula* L., *P. nigra* L., *P. alba* L. Hornbeam: *Carpinus Betulus* L. Maples: *Acer pseudoplatanus*, *platanoides*, *campestre* L. Ash: *Fraxinus excelsior* L. Elms: *Ulmus campestris* L., *U. effusa* Wildenow and *U. suberosa* Koch. Linden: *Tilia grandifolia* L. and *T. parvifolia* Ehrhard. Besides, there are several species of *Sorbus* and of *Salix*.

It is impossible to ascertain the value per acre of the state and fund forests. This value depends on the locality, on the means of transportation, on the condition of the lumber market, etc. Even an average figure giving an idea of the value of the said forests cannot be given. If the annual net yield per acre is taken as a basis for the valuation of our forests at a rate of 3 per cent, then the average value of the state and fund forests per acre will amount to \$8.91. It is likely to range between \$3.50 and \$20 per acre, according to the possible yield.

From actual purchases and sales of state and fund forests, the following data may be taken, the sales taking place between the years 1800 and 1870: State forests, 2,060,232.6

acres were sold at \$22,192,749, or at an average of \$10.77 per acre; fund forests, there were sold 742,247 acres at a price of \$11,520,024, or at \$15.52 per acre on an average. The prices obtained for different portions of the forest, of course, were very variable. A sale of forest lands in Galizia, aggregating 285,733 acres, brought \$1,685,974, or \$5.90 per acre. Another sale of 80,209 acres, lying in Bohemia, netted \$3,259,480. or an average price per acre of \$40.64.

More recently there were purchased by the state and by the several public institutions owning fund forests: In the year 1887, in Kärnten, the domain Tarvis Föderaun, aggregating 32,569 acres, at a price of \$190,350, or at \$5.84 per acre. In the year 1889, in upper Austria, the domain of Weyer and of Reichraming, further two domains in Steiermark, holding altogether 108,254 acres, at a price of \$988,200, or \$9.13 per acre. In the year 1890 the domain of Nadworna (Galizia), aggregating 198,133 acres, for the consideration of \$919,350, or \$4.64 per acre. In the year 1895 the domain Veldes (Krain), consisting of 50,781 acres, for \$567,000, or at the price of \$11.17 per acre.

During the twenty years between 1874 and 1893 there was expended annually on an average:

I. For forestry proper, namely, forest utilization, transport of forest products, charcoal burning, maintenance of forestry buildings, silviculture, etc	\$732,578.17
II. For agriculture, namely, expenses for administration and for maintaining buildings.....	9,675.45
III. For other branches, namely, for technological industries, for shooting grounds, fishing, timber yards, etc	87,193 67
IV. For administration, including the salaries for all local officers, rangers, guards, etc., their traveling expenses, the expense of keeping up buildings used by these officers, etc.....	418,499.05
V. For public expenses (taxes and charity expenses) ...	259,867.44
VI. Money refunded	756.13
VII. Extraordinary expenses (purchase of real estate, new buildings, new surveys, demarkation of bound-	

... to the ...



ary lines, forest working plans, prescriptive rights, etc.)	143,845.88
VIII. Administration at headquarters (expenses at the territorial offices and at the Ministry of Agriculture)..	151,340.20

Grand total expense.....\$1,803,755.89

During the same period—namely, during the twenty years between 1874 and 1893—the mean annual gross receipts amounted to:

I. From forestry (sale of fuel and timber, of charcoal, of minor forest produce, etc.)..	\$1,727,805.73
II. From agriculture (rentals from land leased, etc.).....	161,592.16
III. Technological industries (rents of buildings and establishments, rents from shooting and fishing licenses, rents from yards, etc.)	291,747.02
IV. Money refunded.....	6,524.15
V. Extraordinary revenue	19,492.24

Total receipts.....\$2,207,161.30

To the latter figures there must be added the value of the prescriptive rights under which the inhabitants of certain villages have the privilege of taking timber, fuel, grass, etc., from the forest without refunding any money for such taking, estimated at.....	290,336.40
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Therefore grand total gross receipts\$2,497,497.70
Deducting from this amount the expenses previously mentioned, there remains a net revenue of..... \$693,741.81

Thus the entire state and fund forests of the Austrian Empire have netted on an an average, during the above named period of twenty years, 26.8 cents per acre per year.

During the five years lying between 1887 and 1893 there were planted up annually on an average 15,614 acres, by means of planting seeds or planting seedlings, at an expense of \$28,586.01 for labor only. To these planting expenses there must be added the annual expenses incurred for the following items, namely:

I. For raising, transplanting and nursing plants in nurseries proper	\$17,894.78
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II. For preparatory work, as drainage, subsoiling, making mounds to plant upon, etc	1,694.96
III. For cleaning and attending to the young forest previous to the age of, say, 20 years	6,406.72
IV. Spades, picks, mattocks and other tools.....	834.02

Adding these items to the above named figure of \$28,586.01, the grand total expense for replanting amounts to \$55,416.49, or to \$3.55 per acre.

Of the entire forest area of 2,590,182 acres, six-tenths of one per cent are planted up annually. Of these 40.5 per cent were planted with seeds and 59.5 per cent were planted with seedling plants. For planting seeds there were used annually 23,669 kilograms of coniferous seeds; further, 561 hectoliters of acorns and 10,543 hectoliters of walnuts. The number of seedlings planted annually averages 17,604,196, planted out on 9,294 acres.

Regeneration is effected partly from self-sown seed under the cover of mother trees, partly from coppice shoots, partly by planting and sowing after clear cuttings as indicated above. Besides, where natural regeneration fails, planting seeds or seedlings takes place. The number of acres either wholly or partly cut over annually is 18,212. Of these, 55 per cent, or 10,108 acres, are planted up artificially by means of sowing and planting, whereas 45 per cent, or 8,104 acres, are regenerated from self-sown seed or from coppice shoots.

The difference between the area planted up annually, namely, 15,614 acres, with the area replanted annually after a clear cutting just mentioned, namely, 10,108 acres, amounts to 5,506 acres, and may be explained partly from the fact that on a considerable fraction of the 8,104 acres just mentioned artificial help is needed when natural regeneration fails, partly from afforestation of areas not occupied by forest crops heretofore.

The total amount of the annual harvest, or annual cut, on the whole area under state forest management is pretty constant, whilst it is more or less subject to changes in the

different territories or forest ranges, according to market conditions. Owing to the system of roads and railroads in the forest of Galizia and of the Bukowina being extended annually, the annual utilization of forest produce in the state and fund forests is expected to increase in the future. The annual cut depends on figures prescribed by forest-working plans. It is never allowed to surpass the yield capacity of the forest.

Aside from charcoal burning, forest products are sold before manufacturing takes place. The trees to be cut are felled, freed from branches, and cut up into logs, and, if so desired, split up and freed from bark at the expense of the owner of the forest. "Timber" consists of: (1) Timber fit for building purposes which is not cut up into logs; (2) saw logs, the length of which depends more on the conditions of the log than on inspection rules; (3) "work wood," which means timbers fit for carriage work, for turnery, etc.; (4) split timber, used especially for cooperage purposes. "Fuel" consists of wood for burning and wood for charcoal making. The former is cut up into pieces one meter (or 3.281 feet) long, the bark not being removed. According to the diameter of the log from which the fuel is taken, it is sold either split or unsplit. It is piled up according to quality, in distinct and separate piles. Fuel for charcoal burning is cut into pieces two to three meters long.

Relative to the reforestation of ground allotted to forestry, the main rules are found in paragraphs 2, 3 and 4 of the imperial "Patent," dated Dec. 3, 1852, which run as follows: Paragraph 2: "Without special permission, no forest ground must be devoted to other purposes than timber production. If forest ground is used for other purposes than timber production, the owner shall be fined 30 cents to \$1.50 per acre. After such unlawful use the ground must be replanted within a time prescribed by the local authorities. If reforestation does not take place within the

time thus prescribed a second punishment shall take place." Paragraph 3: "Areas cleared from forests are to be planted up with timber species within five years after the clear cutting in the case of forests owned by the state or by the communities. Wherever there are clearings left from olden times they must be planted up within a period equal to the time fixed for the rotation of crops or fixed as the age of maturity of trees. In the case of private forests, a longer space may be allowed according to circumstances. Whosoever neglects this prescription shall be punished in the same way as if he had used forest ground for other purposes than for timber production." Paragraph 4: "No forest must be devastated; i. e., it must not be treated in such a way as might endanger or render impossible the continuation of timber production. If there is such danger, the fine to be imposed upon the owner of the land shall be the same as if forest ground was used for other purposes than timber production, or as if afforestation was omitted after a clear cutting. Aside from the fine, afforestation shall be made by force, if necessary, the owner bearing the expenses."

If the treatment was such as to render timber production impossible for the future, a fine up to \$3 per acre shall be imposed upon the owner. Under these rules or laws the local authorities have planted up during the years 1891 to 1895:

In state and fund forests, 231 acres; in communal forests, 28,269 acres; in private forests, 126,949 acres.

Preventives against forest devastation were taken:

In state and fund forests, on 1,393 acres; in communal forests, on 328,487 acres; in private forests, on 1,003,342 acres.

The statistics for the years 1891 to 1895 show that there occurred 3,007 forest fires, running over an area of 19,310 res, and causing a loss of \$163,904. On the yearly aver-

age, 601 forest fires have run over an area of 3,862 acres, involving \$32,781 damage.

These fires were caused: By carelessness, in 1,210 cases; intentionally, in 181 cases; by sparks from locomotives, in 118 cases; by lightning, in 26 cases; by unknown agents, in 1,472 cases.

The officers of the state forest administration have a general rank equal to all technical branches of government administration. The forest officers in Austria are divided into two groups, one of which is attending to the administration of the Austrian state and fund forests, whilst the other is charged with the control and enforcement of all laws and rules enacted with reference to forestry. The latter forest officers are joined to the local political administration.

All government officers are allotted to different grades or ranks, the rank depending on their merit and their age, and being combined with a certain title and with a definite income peculiar to that rank. Forest officers are found in the following ranks: Tenth rank, forest assistants engaged in the administration of state and fund forests drawing a salary of \$364 to \$405 per annum, to which there must be added an additional pay varying from \$64 to \$162, according to the time which the officer has spent in government service; ninth rank, head foresters entrusted with the local administration drawing a salary of \$445 to \$526, with an additional pay varying from \$81 to \$202; eighth rank, a forest master, or inspecting officer, draws a salary of \$567 up to \$729 and an addition from \$97 to \$243; seventh rank, a forest counselor draws a salary of from \$810 to \$972 and an additional pay of from \$142 to \$283; sixth rank, a superior forest counselor draws a salary of from \$1,134 to \$1,458, in addition to a pay of from \$162 to \$324, depending on time of service. The traveling expenses, daily allowances on journeys, etc., differ according to the rank of the officer. Many of the local officers are living in government

buildings, paying a rent equal to one-half of the additional pay above mentioned.

Rules, instructions, laws, etc., are issued by the several branches of the forest administration whenever such enactments are necessary. Besides, the following printed matters are issued periodically or annually: 1. Report of the royal and imperial secretary of agriculture. 2. Statistical year book of the royal and imperial secretary of agriculture. 3. The year book of the administration of state and fund forests.

The prominent forestry periodicals published in Austria are: 1. The Austrian Forest and Hunting Paper (weekly). 2. "Central Blatt" of Forestry (monthly). 3. The Austrian Quarterly for Forestry, published every three months. Besides, the forest associations of the different sections of the empire publish material whenever they think it fit for the benefit of their members.

Germany seems to rank first among the European states as regards forestry, followed closely by Austria, having to deal with much more difficult conditions in the high mountains than Germany has to do anywhere. The system of roads and railroads is probably best developed in Austria. Forestry in France is taking high rank as well.

PRIVATE FORESTS.

At the close of 1895 the entire forest area of Austria was 23,993,442 acres. Deducting from this figure the area of the state and fund forests, aggregating 3,782,369 acres, there remain 20,211,072 acres, which are composed of communal forests to the extent of 3,456,782 acres, and private forests to the extent of 16,754,290 acres.

There are treated according to forestry principles proper: In the case of communal forests, 14.5 per cent, equal to 500,818 acres; in the case of private forests, 38.4 per cent, equal to 6,434,070 acres. In these forests all work is done

according to working plans, periodically made by officers of a training equal to that of the government forestry officers. In 85.6 per cent of the communal forests (2,955,964 acres) and in 61.6 per cent of the private forests (10,320,220 acres) no working plans exist. The work is done without reference to scientific forestry, more or less at haphazard after empirical rules.

The price of private forests depends on the quality of the soil, the age of the forest, and on the locality, viz., on the market conditions and on the industrial development of the section in which the forest is situated. Thus it is impossible to give even an approximately correct figure representing the value of private forests. Forest land has been sold actually at prices ranging between \$5 and \$340.

The annual net revenue drawn from forestry varies just as much as the value of the forest itself. It is impossible to give any exact figure showing the annual net revenue from private or communal forests. A net revenue of equal to two or three per cent of the capital invested in forestry may represent a fair average.

The annual production of timber and fuel in the Austrian forests has somewhat declined of late. Savings are made everywhere to make good former over-cutting. Besides, the regulations of the forest laws are now being enforced, and under these enforced laws the utilization of forest produce had to be diminished. In the year 1890 the total harvest of timber and fuel from 24,173,333 acres of forest aggregated 29,341,590 cubic meters, or 1,035,758,127 cubic feet. In the year 1895, on the other hand, there were cut from 23,993,442 acres only 27,523,241 cubic meters, or 971,570,407.3 cubic feet.

It may be stated that the smaller figures, representing the area of the forest in 1895, are explained by the fact that the political authorities, whenever they think it fit after consulting the foresters in charge, approve of a change of forest land into agricultural or pasture land. Besides, the

diminished area is partly explained by mistakes made formerly in the survey of the forests.

DUCHY OF BADEN.

STATE FORESTS.

The aggregate extent of the state forests of Baden is 240,304 acres, located in the Black Forest and the upper valley of the Rhine. The prevailing kind of trees is coniferous. The beech, however, covers the largest surface; next follows the fir, then the silver fir and the Scotch fir. The average estimated value per acre, taking the average of the ten years 1886-1895, is \$98.55. The annual aggregate expense of administration is \$568,078. The annual aggregate revenue amounts to \$1,235,332, and the net revenue is \$667,244. Number of acres annually sown to forest is 222, and the number of acres planted is 823. Re-foresting is effected by seed from standing trees; also by planting trees, in some rare cases by artificial sowing, the latter in the case of firs. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the Forest Law of Baden of the year 1879, no part of any forest is allowed to be kept uncultivated. The number of forest fires during the years 1879-1888 was 61, the damaged surface 99 acres, and the damages amounted to \$2,225. The principal causes of such fires are negligence, when burning down the skirts of the forest, or by throwing away matches or stubs of cigars. Very few cases of fires are caused by railroad locomotives.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff



Open country like what is often seen in the forest regions of Minnesota. This sketch is taken on the road approaching Turtle Lake, near Buena Vista, Beltrami County. In the distance is seen a clearing made about the year 1800 for Hudson's Bay trading post. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



On head waters of the Mississippi. Bridge across the Little Mississippi, between Bemidji and Moose. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



of salaries. Seven members of the Administration of Domains (which forms a part of the Treasury Department) are the highest forest officers. They bear the title of Councilors of the Forest Board, and have a salary not exceeding \$1,380 and \$147 compensation for rent.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

PRIVATE FORESTS.

The aggregate extent of the private forests is 451,670 acres. About one-third of all private forests is managed on forestry principles, including the forests of the Public Administration of Street, River and Railway Construction, and the most extensive and important private proprietors. The total forest product of the country increases gradually.

BAVARIA.

STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its forests comprise 2,150,000 acres, of which 34.08 per cent are the property of the state. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian Forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the

forest land is \$50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to \$4,965,204. The total revenue from the forests the same year amounted to \$8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforestation is mainly done in the natural way. In the case of the fir (*Pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforestation is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only \$974, in 1894 only \$1,686. The principal cause of such fires is the carelessness of the workingmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by rail-



road locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councillor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

There is no regular report published on the administration of the forests; however, the reports of the Royal Bavarian Bureau of Statistics, which are published four times a year, and the "Statistische Jahrbuch für das Königreich Bayern," which is issued annually since 1894, contains some data referring to Bavarian forestry. In addition budget reports on the administration of the state forests are submitted to the "Landtag" or Diet every second year.

PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely.

The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would of course also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,500,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,700,000 acres; forests of the municipalities and of the public institutions, 4,700,000 acres; forests of individuals, 16,100,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the Cork Oak (*Quercus Suber*), the Evergreen Oak (*Quercus Ilex*), the Cluster Pine (*Pinus Pinaster*) and the Aleppo Pine (*Pinus Halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European Oak (*Quercus Ruber*), the European White Oak (*Quercus Pedunculata*), the Beech (*Fagus Sylvatica*), the Hornbeam (*Carpinus Betulus*), the common European Ash (*Fraxinus Excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the Pectinal Fir (*Abies Pectinata*), the Norway Spruce Fir (*Abies Excelsa*), the Beech (*Fagus Sylvatica*), the Scotch Pine (*Pinus Sylvestris*), the Mountain Pine (*Pinus Montana*), the Larch (*Larix Europea*).

It should be noted that the beech is found at the same time in the temperate and in the cold regions. The Scotch pine, which belongs to the cold region, has been artificially introduced on large areas in the temperate region.

STATE FORESTS.

The total area of the forests of the state, 2,700,000 acres, is composed of 2,100,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet)	33,800,000
Fire wood (cubic feet).....	62,300,000
Total	96,100,000

This represents nearly an annual production of 46 cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is \$5,500,000, or \$2.62 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as \$8 per acre.

The expenses are as follows, viz.:

Labor.....	\$1,240,000
Forest instruction.....	35,000
Sundry works.....	360,000
Reforestation of mountains	700,000
Taxes paid to departments and municipalities	360,000
Sundry expenses	60,000
Total.....	<u>\$2,755,000</u>

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforestation mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed \$1,500,000, or 71 cents per acre. The net annual income of these forests is therefore \$2.62 less 71 cents, equal to \$1 91 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations made by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforestation from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at

a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintenance of forest roads, water sawmills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforestation has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is \$10 per acre.

Very considerable reforestation is made on mountain lands, where the state plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose \$700,000 are expended every year, the largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The state purchases yearly on an average 16,000 acres. The average cost of reforestation is \$20 per acre, and \$18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 3 administering

general inspectors, 10 inspectors, 5 assistant inspectors and 17 clerks.

An exterior service composed of:

First—Personnel superior or of administration—32 forest keepers, 200 inspectors, 215 assistant inspectors, 250 general wardens.

Second—Personnel inferior or of surveillance—3,500 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

SUPERIOR OFFICIALS.

Director	\$3,000
Administrators	1,800 to 2,600
Forest keepers	1,600 to 2,400
Inspectors	800 to 1,200
Assistant inspectors.....	600 to 800
General wardens.....	300 to 520

Exclusive of some additional allowances for traveling expenses.

INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of.....	\$160.00
Foremen and wardens paid by the municipal corporations and public institutions.....	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.



Shore of Lake Itasca from where discovered by Schoolcraft, July 13, 1832. A fine body of Norway and white pine. Photographed, August, 18, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Lake Itasca, looking south. Bear Paw point on left; Schoolcraft's island on right. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,700,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,500,000 acres. They produce annually, timber, 42,000,000 cubic feet; fire wood, 128,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 38 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is \$6,400,000, or \$1.42 gross income per acre. The net income is about \$1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the President of the Republic. These regulations and those of the state forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

U. S. F. S.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve and oftentimes leave none at all. One can notice, however, that the principles of Sylviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of \$4 to \$20, carrying or lighting matches in or within a distance of 200 metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines,

on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Algeria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of \$600,000.

The periodical on forests that has the largest circulation in France is the "Revue des Eaux et Forêts," issued twice a month. It is edited by "J. Rothschild, 13 rue des St. Peres, Paris." The price of a yearly subscription for foreign states is \$4. The Administration of Forests does not publish an annual report, but limits itself to furnishing to the public authorities the information that may be called for.

HESSE-DARMSTADT.

STATE FORESTS.

The state forests of the Grand Duchy of Hesse-Darmstadt occupy 165,000 acres, and are situated in the Rhine valley (on alluvial sand), in the Vogelsberg mountains (on

basalt and red sandstone), and in the Odenwald mountains (on granite, syenite and red sandstone). The prevailing species are beech, occupying 40 per cent, scotch pine, occupying 34 per cent, and oak, occupying 16 per cent of the area under forest; whilst the remaining 10 per cent consist of spruce, fir, larch, alder and birch forest. It is a noteworthy fact, proved from the writings of Caesar, Tacitus and of early German authors, that there were no coniferous trees present in their time except Yero. Pine was introduced only from the 15th century on. The average value per acre is about \$100; but there are great differences according to quality of soil, transportation facilities and density of population. The annual aggregate expense of administration is \$148,500; and the annual aggregate revenue is \$561,000. There are planted annually to forest 750 acres, the planting extending over the entire surface of the ground. On 2,500 acres, according as "blanks" in natural regenerations are stocked, partial planting takes place. There are used on an average per annum: 110,000 pounds of seeds of broad leaved species; 4,000 pounds of seeds of coniferous species; 5,000,000 broad leaved seedlings; 5,000,000 coniferous seedlings. The annual expense for starting new generations of trees aggregates \$22,000. Beech is invariably raised from the seed dropping from mother trees evenly distributed. Scotch pine is planted when one year old, over 10,000 seedlings being used for each acre. Spruce and fir are planted when four years old, or seeds are sown in strips being about four feet apart. Oak is either planted as a seedling two feet to three feet high, or acorns are dibbed in, the method used depending on local conditions. All plants are raised in forest nurseries, kept under the care of local forest rangers. Comparatively large areas are covered with oak-coppice forest, which is copped every 15 to 20 years, with a view of obtaining tanning bark. White pine and douglas fir have been in-

roduced with splendid success. American red oak and hickory seem to answer the local conditions fairly well.

In certain densely populated sections, where soil fit for agriculture is scarce, field crops (potatoes and rye) are raised together with tree crops during the first three to five years following the cutting of mature trees. Rows of potatoes alternating with rows of pine seedlings are frequently seen. This combination reduces the expense of reforestation. It secures for the seedlings a soil of high porosity, whilst it exhausts, on the other hand, the mineral contents of the ground and the accumulated layer of humus.

Reforestation is effected on about 40 per cent of area by seed from standing trees; on about 10 per cent of area by coppicing and on about 50 per cent of area by artificial sowing and planting. The annual yield is strictly sustained. The yield per acre per annum is 74 cubic feet, of which not less than 60 cubic feet is used as fuel. The value of cordwood piled up along forest roads is about \$2.50 per cord. The value of logs cut and hauled to forest roads is about \$11.25 per 1,000 feet board measure. As to the usual method of cutting a crop, about 30 per cent of the yield is made up of stuff obtained from thinnings. The remaining 70 per cent consists of mature trees. Wherever regeneration is effected from self sown seed, the mature trees are gradually removed. Where planting is resorted to, a clean sweep is made of all mature trees over areas aggregating about 25 acres on an average. Large clearings are considered a mistake, as it is difficult to restock them.

With regard to compulsory reforestation the following may be said: Private forests must be planted up within three years after the removal of a mature crop. Exemptions from this rule may be granted, upon application, by the State Forestry Bureau. Waste land planted up by the owner is, once for all, exempted. If a forest owner hesitates to replant his clearings within three years after the cutting of the trees, he is subject to a fine. The forest authorities

will replant the clearing at the owner's expense, the owner being allowed the choice of species. Any treatment of forests likely to result in permanent unfitness for the production of timber, is prohibited.

Little damage is done, generally speaking, by forest fires. On the average annually 54 fires are reported, running over 45 acres altogether, and resulting in an annual loss of \$533. In 28 cases out of 272 cases the forests were so badly damaged that it was considered wise to cut the trees and replant the area thus cleared. The principal cause of forest fires is carelessness of smokers. A few only of such fires are annually caused by railroad locomotives, perhaps three annually.

The rank of the forest officer corresponds entirely with the rank of officials in other branches of the public service. The average salary per year of the "Oberforstrat" is \$1,300, of the "Oberforstmeister" \$1,125, of the "Oberforster" \$825, and the office and transportation expenses of the two last named are \$350 and \$200 respectively. No official report is published, either annually or periodically.

PRIVATE FORESTS.

The extent of private forests is as follows: Communal forests, administered by state foresters, 235,000 acres; entailed forests, owned by families, 132,000 acres; ordinary private forests, owned by individuals, 70,000 acres; total, 437,000. All communal forests and all entailed forests are managed on forestry principles, furnishing a sustained yield. The condition of the ordinary private forests is deteriorating, as the productiveness of the soil is abused by pasture, removal of litter and incomplete density of leaf canopy. Communal and entailed forests are worth as much as state forests, namely, about \$100 per acre. The value of private forests owned by individuals is considerably less. The average rate of net income is about $2\frac{1}{2}$ per cent. The total product of the country is well sustained.

Considerable sums are derived in state and communal forests from hunting and fishing leases. The foresters of all grades enforce, *ex-officio*, all fish and game laws. The subaltern foresters, as a general rule, are taken from the army.

The wages of the common laborer average about 50 cents per day. In the mountainous sections wood fuel is cheaper than coal. In the state forests \$24,700 are annually spent for new roads, or for macadamizing old roads. The state oberforster is at the same time the manager of all municipal or village forests lying within his district. The sale of forest produce, however, is done by the mayors of towns and villages. A splendid system of well graded public roads, covered with stone in the Telford system and maintained at an annual expense of \$270 per mile, facilitates economic forestry to a very high degree.

NORWAY.

STATE FORESTS.

The extent of the state and semi-public forests of Norway is 2,587,500 acres. Of these 837,500 acres are located in the provinces of Tromso and Finmark; 140,000 in that of Norrland; 285,000 in North Drontheim, and 225,000 acres in South Drontheim and Romsdal, and about 397,500 acres in Hedemarken. The prevailing kind of trees are pine (*Pinus sylvestris* L.), spruce (*Abies excelsa* D. C.), and two species of birch. The average estimated value of the forest land is \$2.70 an acre. The annual aggregate expense of administration is about \$108,000, and the annual aggregate revenue varies from \$60,000 to \$67,500. The number of acres annually sown or planted to forest varies from 150 to 175 acres. Reforesting is almost entirely effected by natural seeding from standing trees, and, when artificial culture is employed, by planting trees. The crop of forest production

is periodical, and depends partly on the market prices of lumber. The forest administration tries to prevent the yearly average yield exceeding the net increase of the forest. Cutting must in part depend on the demand. Where it does not pay to cut smaller trees, the mature ones are principally cut, while at the same time, as far as possible, diseased and injured trees, as well as such as would hinder in the growth, are removed. Where, on the other hand, trees of smaller size can be profitably sold, small blocks are cut clean in order better to promote new growth.

The law of July 20, 1893, on the preservation of "Protecting Forests" and against the destruction of forests, has special provisions relating to "Protecting Forests," by which are meant forests serving as a protection against snow avalanches, stone slips, alteration of river beds, shifting sand, or as a special protection to other forests or to inhabited country. "Protecting Forests" are also such as bound districts and mountain forests, which, from their situation on the slopes of high mountains or in the neighborhood of the sea, or in the far north, grow so slow that they would die out if neglected. Under "Protecting Forest Lands" are also included bare fields, to be planted in the future to serve as other "protecting forests." The municipal council selects three men, who, after consulting the public forest officer, propose the localities within the district to be considered as "protecting forests." The municipal council has then to fix the boundaries of the forests, and on the proposition of the forest inspector of the district to determine the rules for its management. These regulations must have the sanction of the king to be valid. The municipal council can also make reservations, subject to the king's approval, against the destruction of the forests in general. Such municipal regulations relating to "protecting forests" and forests in general may probably also include compulsory regulations as to planting and sowing of forests already cut down. No other laws relating to forest culture exist in Norway.



Residence, belonging to the State of Minnesota, of the Superintendent of the Itasca State Park. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Mixed forest—large-leaved trees, pine and spruce—on southwest shore of Lake Itasca, in State Park. Photographed, August, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

The damage caused by fires in the public forests is inconsiderable. Many years there is none; and the damage done to private forests is of small account and unreported. The principal cause or causes of such fires is carelessness of owners, fishermen, cowherds, etc., as well as the burning of heather for cultivation of the land. The law of July 14, 1893, on "Fires in Forests and Fields," with the supplemental law of July 27, 1896, has provisions relating to the prevention and extinction of forest fires.

The central administration of the forests is directly under the department of the interior, without intermediate officers. The service is under the charge of the chief (the director of the forests), and there are 4 forest inspectors, 25 forest officers, 1 forest engineer, 2 assistants, 7 forest planters and 363 forest guards. The yearly salary of the chief (the director) is \$1,450, without additions. The inspector's salary is \$800, increasing up to \$970. The forest officers', \$480, increasing to \$800. All these functionaries have their traveling expenses paid when traveling in the service of the state. The officers and the inspectors hand in every year a report to the director, who publishes a report on forest matters generally every third year. The only forest periodical in Norway at present is the "*Tidsskrift for Skovbrug*," (Periodical for Forestry), published by the Norwegian Association for Forestry.

PRIVATE FORESTS.

The aggregate extent of private forests is 18,000,000 acres, of which about 276,000 acres are managed on forestry principles. The average value per acre is from \$4.28 to \$5.36, and the average annual rate of net income is from 55 to 60 cents per acre. The cutting undoubtedly exceeds the natural increase of the forests. The supply of wood is consequently decreasing, and the size of the trees decreases. The government purchases annually forests to the amount in value of \$21,440. It has three large and several smaller

nurseries. These supply the required number of plants to the public and to private parties. It has also four seed establishments, which supply the public and private demand for tree seeds. It also has two elementary schools of forestry, and it tries through its functionaries to instruct forest owners in rational management of the forests.

PRUSSIA.

STATE FORESTS.

The extent of the state forests of Prussia is 6,955,227 acres. Included in this, however, are 715,637 acres not designed for tree culture. In addition, the extent of forests belonging to municipalities is 2,563,812 acres; belonging to churches, 207,752 acres; belonging to corporations, 555,900 acres; private forests, 10,828,730 acres; making an aggregate extent of 21,111,421 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, larch, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to \$700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1893 to 1897, per annum, \$8,500,000. The annual aggregate revenue in the years 1893 to 1897 amounted to \$17,200,000, being at the net rate of \$1.50 per acre of actual forest. The number of acres sown or planted with forest annually during the years 1893 to 1895 was 44,830.

The foresting of the beech is mostly effected from standing trees, though artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. The

Scotch pine is first cut clean and reforested by sowing or planting, and the red pine the same. Sowing from standing trees is not common. In regard to the continuity of forests products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of July 6th, 1875; the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1892 to 1896 was as follows: Totally or mostly destroyed, 2,992 acres; only slightly damaged, 117 acres; only the surface destroyed, 522 acres. The average annual number of forest fires in the years 1892 to 1896 was 36, the causes of which were as follows: 12 unknown, 2 railroads, 5 incendiary, 16 caused by carelessness, 1 lightning. During the years 1892 to 1896 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The foresters have clerical rank. The salary of "Oberforster" (district manager) ranges according to length of service from 2,700 to 5,700 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 600 marks annually. In addition there is usually free residence and fuel. The salary of the "Oberforstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberforstmeister" and "Forstrath" are each allowed an amount not exceeding 2,900 marks for traveling expenses.

Among the best German forest periodicals are the Forestry and Hunting Magazine, by Dr. B. Dankelmann, Royal Prussian "Land Forstmeister" (forest councillor) and

director of the forest academy at Eberswalde, and the Forestry Magazine, by "Oberforstmeister" Weise, director of the forestry academy at Muenden. "The forestry conditions of Prussia," by Julius Springer, Berlin, is also referred to.

PRIVATE FORESTS.

The extent of private forests in Prussia, as above stated, is 10,828,780 acres. About one-half of these forests are managed on forestry principles, and their average value is somewhat less per acre than that of the state forest. On the larger estates the area devoted to forests gradually increases, while on the smaller estates the forest area probably decreases.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the excellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of \$1.33 an acre from her 6,000,000 acres of state forest,

our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

WHAT A MAINE TIMBER EXPERT SAW OF GERMAN FORESTRY.

Mr. Austin Cary, a timber expert of Bangor, Maine, who lately visited Germany to study its forestry, furnishes a very interesting and valuable paper on the subject in the report of the Forest Commissioner of Maine, from which I take the following extracts :

It is my purpose here to try to give some little idea of German forestry. Germany is an old country. Centuries ago what we might call its virgin timber was exhausted, and the country found itself with a dense population dependent on a limited area of land to supply its needs for wood material. What should they do? Should they stint their use in this direction to a niggardly amount? Should they exploit new territory and call on the stocks of newer countries for their supply? They did neither of these things. They went to work rather on their own soil to develop fully the resources and capabilities of their own land. The states and the nobles supported the work. Scientists labored and managers experimented. Forest schools were established to spread through the land the knowledge of what had been gained. Finally they piled up a mass of exact information about trees and everything related to their life, and established a system of forest management based thereon that is one of the finest monuments of the thoroughness, the conservatism and the patience of the German race. And to-day the forest stands as one of the prime objects of the people's regard, a source of health, wealth and national independence.

This report is concluded after several months' study on the ground of the forests of South Germany. As illustrations of what scientific forestry can do I wish to tell of a few representative facts that came under my own observation.

The first forest of which I gained any knowledge was the property of the city of Freudenstadt in Württemberg. I remember thinking, as I rode up to the place by rail and found it a city of 6,000 inhabitants, that it wouldn't do for a man like myself, who wished to see nothing but woods from morning till night, to live in the city. I would get off into the woods themselves and live. How great was my mistake! The forest was all about us. In five minutes' walk from the center of the city one could step into such fine woods as cannot be found in

the whole state of Maine. Spruce and fir trees two to three feet through and all the way up to 130 feet high stood on the ground as thickly as they could stand. There were acres there that would cut more than 100,000 M. The previous summer I had cruised all through the spruce lands of the Kennebec, and here on single square miles was more timber than on whole townships on that river. And the best of it was that this was no new or exceptional thing. The whole area of the forest was doing it. If it hadn't old timber it did have young, which is quite as essential to the result. They were growing that timber right along because they knew how to do it and because they were patient enough to wait for results.

The financial returns from this forest will be of interest. The yearly net revenue derived from its 5,950 acres had amounted in the last few years to from \$20,000 to \$25,000. The yearly yield of wood had been 106 cubic feet per acre. The revenue paid all the municipal expenses of a city of 6,000 people, relieving the citizens from local taxation and paying a bonus to each voter besides.

Baden Baden is another good illustration. The city owns 10,000 acres of forest land in its immediate vicinity, kept under the best of management, just about the equivalent of half a township of our Maine timberland and in much the same kind of trees. The yearly net revenue from this tract, as an average from 1881 to 1891, was nearly \$3.50 per acre. That is about the total valuation, timber, land and all, of a pretty good Maine township. A yearly net income of \$35,000 has here, it can readily be understood, a significance in connection with municipal expenses.

These two instances are by no means exceptional. The Black Forest, in which both these tracts are included, is a region of high and rough land about a million acres in extent, partly in Baden and partly in Württemberg. It is well cut up with railroads and turnpikes; it has towns and villages scattered all through it, but much the greater portion of its area is covered with trees. It is divided in ownership between the states, cities and towns, and private individuals, of which the publicly owned forests are uniformly well managed. The state forests throughout this district yield a net yearly revenue of \$2.50 per acre. Tracts of unusual productiveness have yielded \$10. The best feature of the situation is the certainty and regularity of the supply. The management is splendid in its conservatism. Timber is never cut till it is ripe. Managers take a pride in never making a false show by overcutting. The yearly growth on these forest areas is closely known. Mills and markets have adjusted themselves to their output, and business in consequence is regular and certain.

In speaking of these results of German forestry we must not mistake the conditions to which they are in part due. German forest land in the first place is superior to ours. The soil is deeper and better as a rule, because the country was never glaciated in any such way. Some of their tree species, moreover, are faster growers than our own, though they have nothing equal to the American white pine. Then wood material in German forests is worth much more than in our woods, because it is close to a dense population which needs it. German forest management, however, is in itself a noble achievement. Without it, favorable natural conditions would be of little avail. By its means Germany, devoting a third of its territory permanently to forest—that third which is of smallest value for agricultural and commercial use—has been able not only to supply all her own demands for most kinds of wood material, but to furnish large amounts to less provident neighbors.

With these facts in mind as to the results of German forest management, the way is perhaps prepared for a statement of how they have been attained. Here we must be extremely brief. I propose as that bit of German forestry which seems to have most help in it for us in studying how to make the most of the woods of Maine to give in outline the history of a stand of spruce and fir in the Black Forest as it works out under the guiding hand of an Oberförster of the Baden State.¹

First of all, how does it start? How do the young trees come there? Most readers probably will think they are planted, but such is not the case. The man who has a big bill for nurseries and planting in his accounts is marked as a poor manager, and another may be found to take his place. No. It is rather by understanding the conditions which seeds require to germinate and young trees to thrive in, and making use of this knowledge in clearing off the old crop, that the young stand is founded. Let us, however, omit this for the present, and taking the young stand when it first has possession of the ground, trace through its history.

A twenty-year-old stand of spruce and fir² in the Black Forest looks like one of our thickets that we say is as thick as the hair on a dog's back. The little trees stand closely together, their foliage is high up, and the limbs on the lower trunk killed off. Many of them by force of competition die every year, and when big enough the dead ones are taken out for fuel. And this dense condition is desired and promoted.

¹ Scientific readers must not hold me to strict accuracy here.

² "Spruce and fir." The European "spruce" is the Norway spruce, a very valuable timber tree, and so called because naturally more abundant in Norway than in any other country. The "fir," also called the "silver fir," is the *Abiespectinata*, also a spruce, and common in Europe, but not quite as valuable as the Norway spruce. What is known as "fir" in the United States east of the Rocky Mountains is our common balsam—*Abies balsamifera*.

The unbroken cover of leaves keeps the soil moist in summer so that growth is more rapid than it would otherwise be; the dense crowding cleans the lower trunk of limbs so that the heart lumber of the mature tree will be nearly clear. The trees on an acre of German forest are of approximately the same age. Experience has shown that more lumber and better lumber in the long run can be grown in that way than if trees of all sizes are kept on the ground at the same time.

Such is the condition of things up to forty years of age. The young stand is practically allowed to take care of itself, and this it does to entirely good advantage.

At forty years of age, however, at which time the young trees might be four to eight inches in diameter and fifty feet high, a strong thinning is made. Poor and deformed trees are taken out, those that are diseased as well, and such also as are overcrowded and seem destined to an early death. By this means the stand is much improved. Every tree left standing is one that is straight and good, and it has a good chance to grow. The stand by this treatment may be left pretty open in places, but in the next few years it closes up again. The trees stand as thickly on the ground as they can stand. The dense foliage shields the soil from drying out, and prevents the encroachment of bothersome weeds. The density of a middle-aged stand in a German forest, the completeness with which it occupies the ground, is something hardly to be conceived till one sees it. Second growth pine groves are all we have in this country that approaches it. The shade of the foliage is so dense and complete that not a young tree or bush will be seen for rods. All that covers the soil is a fine, even coating of moss.

So the thing stands for forty years more. Only the trees that are crowded out are removed from the ground. These have a value to sell but none to grow. Most of them go into the manufacture of paper.

At eighty or one hundred years of age, however, another condition of things begins. Spruce and fir at this age will no longer stand densely together. They open of their own accord. Through blow-down or disease, also, little openings in the cover occur, and under these openings, where the sunlight gets down to the ground, a strange thing happens. Little seedlings, which up to this time may have been absolutely lacking, though the ground was showered with seed, begin to appear on the ground. Sometimes there is a perfect mat of them, and the forest manager, remembering that the time is not far distant now when his timber will be mature, when he will have to cut it and will want to replace it with another of the same kind, welcomes their appearance and cares for their welfare. As they grow larger and require more light and air, he opens up the old stand around them. With that, too, the patch of young trees spreads. More thinning out assist

Young and mature Norway pine on a school section (given to the State of Minnesota by the United States) in Beltrami County. The young pine will succeed pine by natural seeding, if circumstances are favorable. The old pine will come up if trees are kept out.



it; different regions of thinning run into one another. Finally the whole area of the stand has been lighted up, young trees have followed the favoring treatment and a dense crop of them covers nearly every square rod of the ground. Much of the old stand has in the meantime been reaped. What remains to be done is simply to clear off the balance with due regard for the welfare of the succeeding stand. By these measures and on these principles the land, in the course of 120 years, handled, of course, meanwhile by many individual managers, but always with regard for its productiveness in the long run, has produced a magnificent crop of timber, has yielded in the thinnings material much more than paying for the labor of its cutting, and it has afforded steady labor at about the rate of one man per 100 acres to four generations of men. During the last thirty or forty years of that time, simply by gradual removal of the crop and care for the young growth which succeeds correct handling of the conditions of light and soil, a new crop has been started ready to carry on the same process in its turn.

How much of the German practice may be adopted here to advantage, how much of it is possible under our business conditions, can only be told after trial. Whatever we do adopt will be gradually taken up. Many of the measures that are recommended from that source are the same that have been suggested to us already by the facts of our own woods.

Something we must take, however, from the general attitude of the German people to the forest. The facts of the situation, indeed, will compel us. The forest will have to be regarded as a field rather than a mine. Having attained that, we shall have further to learn conservatism and patience. Patience is an essential in successful forest management. Trees grow but slowly to a mature condition. If they are cut before they are fit, the best results, the greatest aggregate returns, cannot be reaped.

On most sites the first principle of forest management, as it must come here, is that principle so often referred to as being already in the minds of our practical men—sparing the small trees. This policy is rendered all the more desirable by the fact that has often been pointed out in the course of this work, the vitality of spruce under shade, its ability to thicken up and grow after long and severe suppression. This policy, as often indicated in this work, will have to be applied with discrimination. The problem of windthrow will be a most troublesome one. The man who has to decide whether timber can be safely left, or whether if left it would merely be condemned to blow down, will have set him oftentimes a very difficult problem.

One great object of conservative forest management, however, will be the preservation of the small trees. With this in view many changes in our present lumbering methods will doubtless in time be made. In some directions the detail of the German practice may help us. Thus, the Germans avoid cutting in the coldest weather when wood is brittle. On the other hand, they like to cut when there is deep snow. That saves the little trees from destruction in felling.

A cardinal principle of the German practice, having value in this as well as in other connections, is never to clear off the whole or the bulk of a stand at any one time. This treatment greatly helps the young trees. Comparatively few are killed when but a portion of the overgrowth is taken, and injuries received they have opportunity to repair. Where a whole stand is cleared off at once little in the way of young growth will survive it.

How far we may be able to follow the example set us it is impossible without trial to say. Perhaps it will be possible in the not distant future to leave half the merchantable timber in a virgin stand for further growth. Such a course would insure a great volume growth on the land; it would allow each tree to be kept till it reaches the finest development; it would help to maintain the proportion of spruce seed supply needed to keep possession of the land. * * *

In Germany the workmen in the forests are trained, almost skilled, laborers. They work all their lives at their business; they are well paid as labor goes in that country; living with their families in the forest, they are put in no such social conditions as are the men in our woods. The German forest laborer is a steady, well conditioned, contented man, who takes a pride in the forest in which he works.

DUCHY OF SAX-MEININGEN.

The area of state forests is 106,530 acres; of communal forests, 84,460 acres; of private forests, 71,850 acres; miscellaneous, 1,480 acres; in the aggregate 264,310 acres, being equal to 42.4 per cent of the total area of the state. The state forests comprise 24 units of administration, in charge of 24 superior forest officers. The highest functionary in forestry matters is the president of the forestry bureau. The bureau is composed of five forest counselors, two of whom act as forest inspectors at the same time,

each one supervising 12 of the above named 24 forest officers. The annual yield of the state forests is 5,779,669 cubic feet of lumber and fire-wood cut in ripe forests, and 1,288,904 cubic feet of fire-wood and pulp-wood obtained from thinnings. These figures correspond with an annual yield of about 155 feet board measure of lumber plus 0.40 cords of fire-wood per acre per annum. The state forest officers at the same time control the management of the communal and private forests within the state. All grades of forest officers have certain police duties concerning forests, fish and game preservation.

The municipalities owning forests are required to appoint well trained foresters for the management of their forest realties.

SAXONY.

STATE FOREST.

The aggregate area of the state forest is 432,000 acres. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,937.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 200,000 acres. The second group in the outskirts of the Erz mountains and in some smaller distinct mountain ranges comprises 136,000 acres; and the third group in the plains comprises 96,000 acres. The soil consists of decomposed granite, granulite, gneis, mica-slate, clay-slate, grauwanke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus silvestris* (L.); silver fir, *abies*

pectinata (D. C.); larch, *larix europæ* (D. C.); rothbuche, *fagus silvatica* (L.); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.); hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L), *A. platanoides* (L); further, several species of elm, *ulmus*; of birch, *betula*; and of linden, *tilia*. The prevailing species is spruce.

The value of the state forests, including timber and soil, aggregates \$76,490,000. Hence the value per acre is \$177. The annual expenses for administration for the year 1896 were \$1,040,000. In the year 1896 the annual gross revenue amounted to \$2,986,000; the annual net revenue to \$1,946,000.

The entire area planted annually varies according to circumstances. On the average it will reach 6,900 acres. Of these 6 900 acres 800 acres are planted up with seeds and 6,100 acres are planted up with plants. About 20 per cent of the above figure 6,900, or 1,380 acres, consist of blanks in plantations previously made where the original planting has failed. Thus it appears that the area planted for the first time after the removal of the old crop is only 5,520 acres. The question whether plants or seeds shall be employed for restocking cleared ground depends on the condition of the soil. As a general rule, seeds are planted only on such areas which do not produce grass and weeds to a large extent and which at the same time are of sufficient fertility and well protected against late frost. The sowing or planting of seeds must be done not later than in the second year after the final removal of the former tree crop. Strips about three feet wide or places about six feet square are cultivated with a spade before the seed is thrown on them. Only in rare cases the entire area to be planted with seeds is ploughed and harrowed and the seeds spread over it broadcast. The plants used for planting up a clearing are as a rule two years old or older. The age of the

plants selected depends on the condition of the area to be planted aside from depending on the species itself. Spruce, scotch pine, fir and larch or tamarack, as a general rule, are used two to five years old; beech, oak, ash and maple, as a general rule, are used three to six years old. The plants are raised in nurseries. Only in rare cases they are taken from areas previously planted with seed in the open forest. The number of plants used per acre ranges between 600 and 4,000, according to the species, the size of the plants used and the condition of the area to be planted.

Regeneration from self-sown seed is only used in the case of the beech (*Fagus silvatica*). In all other cases forests are regenerated by means of planting plants or sowing seeds.

There is no law or rule in Saxony for compulsory reforestation after clearings.

There is not much damage done by forest fires. It averages \$300 per year. Forest fires of a larger extent have happened very rarely. As a rule, forest fires are caused by the careless use of matches by tobacco and cigar smokers. Very few fires are caused by sparks from locomotives; on the average perhaps three per year.

The yield or annual cut is fixed by working plans prepared for periods of ten years and renewed after the lapse of such periods. Within these periods the annual yield is almost constant. At the end of a period, however, a new working plan might provide for either a higher or lesser yield. It is an iron-clad rule that on the whole the cut shall not exceed the increment of the forest.

Trees are cut as low down as possible above the surface of the soil; the instrument used is the saw. The stump and the root are dug out afterwards wherever such work is remunerative, viz., where the wood obtained can be sold at a paying rate. In Saxony regular forest management began with the beginning of the century in a systematic way; con-

"the working plan" which is prepared by the bureau of forest working plans at Dresden, containing prescriptions for a period of ten years. The superior forest officer co-operates in the preparation of this working plan, which has to be submitted to the secretary of finances. The preparation of a working plan is based on a thorough knowledge and a thorough scrutinizing of the conditions of the forest range, which often takes several months. The forest working plan contains a statement showing the areas of the different compartments or units of the forest range; it contains a description of these compartments and maps of the same; all sections of the forests are examined with reference to their increment. All these investigations made, the forests or sections of forests to be cut during the next decade of years are selected and pointed out specifically. Further, there is stated specifically what compartments or sub-compartments are to be thinned out, what areas are to be planted up, and by what means regeneration is to be effected in each single case. Deviations from the prescriptions of a forest working plan must not be made unless authorized by the secretary of finances. Every working plan is controlled by the state forest master in the range itself. Besides, in the midst of the ten years period, or after the lapse of five years, such a control by the highest forest officer of the state takes place, so as to find out whether and in how far the prescriptions of the working plan have been followed and whether deviations might be advisable.

The sale of the forest produce (timber, fuel, bark, stones, etc.) is done by the superior forest officer with the help of a local state cashier, who is holding an office absolutely independent from the forestry service and is directly subordinate to the secretary of finances. This arrangement makes embezzlements practically impossible. The sale of timber and fuel takes place, after they are cut and piled up, by means of public auction. The cutting and piling of timber and fuel is done by common hands working under a con-



White cedar, a little northwest of Hibbing. One of the most valuable of Minnesota trees and being rapidly slaughtered for railroad ties, telephone posts and other purposes. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.



Pure stand of jack pine, about ten miles southwest of Bemidji. Jack pine is found on the poorest soil, and though very much inferior to white and Norway pine, it yet has commercial value. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

tract. Any planting, on the other hand, is done by day workers, under the supervision of the local rangers, so as to warrant careful work.

PRIVATE FORESTS.

According to a statement made for the year 1893, the total area of the private forests in Saxony is 539,000 acres. All forests owned by municipalities and villages and other corporations, and a considerable fraction of the larger private forests, are managed according to true forestry principles. All administrations of municipal, town and village forests are controlled by the state. The working plans for these forests are prepared by the bureau of forest working plans at Dresden. In these cases, the forest working plan is approved of by the secretary of the interior, and not by the secretary of finances, as would be the case for state forests.

It is impossible to give any data as to the average value per acre of communal and private forests. Neither are data available as to their average annual yield. Generally speaking, the yield of private and communal forests is considered to be lower than from state forests. Wherever there are working plans the cut is steady, and even during the period over which the working plan extends. Where there are no working plans, the cut depends entirely on the pleasure of the owner.

Small holdings of forests, especially those of the peasantry, are deteriorating. Parts of such forests are changed into fields or meadows; other sections are purchased by the state, communities or wealthy private individuals.

OBSERVATIONS ON THE FORESTRY OF SAXONY BY DR. C. A. SCHENCK.

Under date of Biltmore, N. C., Nov. 16, 1898, Dr. C. A. Schenck, at my request, furnished the following observations:

Answering your note of November 11th, relative to the money yield of Saxon forestry, I want to state:

During the years 1884-'93 the yield of Saxon forestry per acre was as follows:

	(A) Cubic Feet.	(B) Price per Cubic Foot.	(C) Total Value.
1. Timber (diameter above 3 inches).....	55.73	\$0.0938	\$5.23
2. Fuel (diameter above 3 inches).....	14.29	.06	.83
3. Fagots (diameter below 3 inches).....	17.15	.04	.63

Column (A) gives the yield in cubic feet solid.

Column (B) gives the value of the stuff per one cubic foot solid.

Column (C) gives the gross returns obtained from the sale of such yield per acre.

Remarks to 1: Generally speaking, 1,000 cubic feet solid should furnish 12,000 feet board measure of lumber. However, even in the case of great economy, 1,000 cubic feet solid will not furnish more than 4,000 feet board measure. This is my experience from actual sawing at the mill of the Biltmore Lumber Co., and the same appears from Pinchot's and Graves' pamphlet on the white pine, page 54. Consequently 55.73 cubic feet solid, the figure given in column A, will yield not more than about 225 feet board measure, Doyle's rule, assuming, however, that the logs are used up only to a diameter not less than eight inches.

Two hundred and twenty-five feet, board measure, which the Minnesota lumbermen would obtain from the 55.73 cubic feet of timber, are worth in Saxony \$5.23, as appears from column (C), consequently 1,000 feet, board measure, would be worth \$23.45. This figure would seem to you and to Minnesota lumbermen extraordinary. You should recollect, however, that this is the value of timber cut and piled up along good forest roads, which roads connect either with river courses or with macadamized public roads near by.

The lumberman in Saxony, however, gets more lumber than is contained in 1,000 feet, board measure, for the \$23.45 which he pays for the equivalent in cubic feet. He uses the logs up to a diameter of say three inches. There is practically no waste from slabs, etc. If there was no waste at all he would get 3,000 feet, board measure, out of the wood worth \$23.45, but there is some waste even in Germany, and we might say that the stuff which will yield the German mill men 1,000 feet, board measure, when piled up along good forest roads, is worth to him \$10.

The fact that the German lumberman is buying after cubic feet and that the American lumberman is buying after Doyle's rule makes comparisons very difficult. It is a general experience that Doyle's rule underestimates logs of a small diameter. The same will appear to you from my Pamphlet on Yellow Poplar, which I think I sent to you some time ago, and where I compare the actual output from logs with the output given by Doyle.

In Saxony the trees are not allowed to reach an average diameter of, say, more than 12 inches at breast height (4 feet from ground), consequently the difference between the data given by Doyle's rule for such trees and the actual contents of such trees in cubic feet multiplied by 12 are at great variance.

Remarks to 2: One cord of firewood contains 128 cubic feet of space, partly filled by wood and partly by air. The solid wood contained in a cord does not amount to more than about two-thirds of 128 feet, or to 86 feet, the balance being air space.

Fourteen and twenty-nine one-hundredths cubic feet, the figure which you will find in column (A), represents about one-sixth of a cord of firewood. The price of a cord of wood worked up and piled up along good forest roads is in Saxony \$5.16; the price of one-sixth of a cord, as indicated by column (C), is about 85 cents. This price will frighten you, and others as well. Of course, fire-

wood is worked up only close to the cities, whilst in the mountains all the poorer stuff is left in the forest.

You are right in pointing out that in many European states the poor people are allowed to gather branches and decaying wood in the forest, often having prescriptive rights for such use. In Saxony, however, if I am not mistaken, prescriptive rights have been bought up entirely by the government, and it is probably only near the cities that the poorer classes are gathering branch wood in the forest.

Remarks to 3: Seventeen and fifteen one-hundredths cubic feet of solid wood fibre contained in branch stuff will pile up to about two-thirds of a cord. A cord of fagots is worth about \$1, piled up in the forest along good roads. Two-thirds of a cord is worth about 68 cents, as indicated in column (C).

The returns from fuel and fagots which the Saxony forest is yielding, the Minnesota forest will not yield for a very long time. The comparison, therefore, of Saxony and Minnesota forests should be based only on the timber output.

Here we must bear in mind that the population of Saxony is thirty-nine times as dense as the population of Minnesota and over twice as dense as the population of Massachusetts. We must further bear in mind that the yield of the Saxony forests consists largely of spruce wood, the smaller pieces of which are very valuable for wood pulp, whilst the larger pieces furnish first class butt logs.

We must further recollect that a network of splendid public roads, well graded and well macadamized, are trenching even the remoter mountain districts of Saxony, and that the industrial development of Saxony stands foremost in the German Empire.

Let us imagine that the entire state forests of Saxony were suddenly transported into Minnesota. What would the yield of these forests be under the prices and the conditions prevailing in Minnesota at the present moment? The yield per acre per annum of raw material having over eight

inches diameter at the small end would be 225 feet, board measure, Doyle's rule, per acre, the stumpage of which stuff, standing in the woods, would be worth about \$4 per 1,000; consequently the gross receipts per acre per annum would amount to 225 by 4 divided by 1,000, equal to 90 cents. From this figure there must be deducted only the expense for taxes, administration and protection, which will amount to about 5 cents per acre per annum, leaving a net profit of 85 cents per acre per annum from the forest.

Figuring at 2 per cent, this net yield would correspond with a forest value of \$40.50 per acre.

It seems to me very likely that for Minnesota a higher rotation than the 80 years rotation adopted in Saxony would be indicated. If it was possible, the average diameter of the mature tree would be over twelve inches in diameter, and consequently the yield per acre would be considerably higher, in my opinion.

If any one should ask for an explanation how Saxony, although the yield per acre per annum is only 225 feet board measure, Doyle, draws a net return of \$4.50 per acre from her forests, I think the answer is easy. The gross receipts per acre figured out from column (C) in the above statement add up to \$6.76. To these gross receipts may be added certain receipts for hunting and fishing, of which however no figures are available. If we neglect them, and if we deduct the cost of administration, lumbering, road building, etc., etc., which amounts to about \$2.40 per acre, we reach the figure \$4.36 as representing the net yield per acre of the Saxony forests. The answer desired lies in the following:

First: The Saxony lumberman gets almost three times as much lumber out of 225 feet, board measure, Doyle, as the Minnesota lumberman.

Second: Fuel and fagots have a considerable value wherever the forest is close to town.

Third: The population of Saxony is very much denser than the population of Minnesota and the industrial development in Saxony is almost unrivaled in Germany, consequently the prices of forest produce in Saxony are considerably higher than those in Minnesota.

GRAND DUCHY OF SAX-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres, in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working plans," at Eisenach, the director of the forest academy being at the same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and fire-wood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property, maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintenance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.

SWEDEN.

STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is \$4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was \$185,397, and the aggregate revenue was \$1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about \$10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägmästare," with annual salary of \$1,707 and rank corresponding to the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägmästare," with a salary of \$1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägmästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of \$160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of \$2,400, and having rank corresponding to that of a major general in the army; and a chief of bureau, with salary of \$1,867 and rank corresponding to that of a lieutenant colonel in the army.

There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,135 acres and their average value per acre is estimated at about \$5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote regrowth of private forests.

FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000 acres in Dalarne. About 60,000 acres have been acquired within the last ten years. Of the entire area not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive sur-

* Information furnished in Swedish by Dr. Fredrik Lovn, chief forest master, through Mr. Gust. Jansson, manager of the Munkfors Iron Works.

face of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Råmen, in Vermland, and the boundary of Dalarne terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the "hyperite" hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500 feet above the sea; thereafter they take a plateau form, but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut or broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harf-

jellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, is called a "tjell" (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest-covered.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one or two cows and several smaller animals are fed. About 14,000 persons live and gain their livelihood on the company's property.

About 3,000 acres (2,700 to 3,000 "tunnland"; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ("hjelp-och rensningsgallringar"), and thinning to admit light ("ljushuggningar"), consisting of two to three careful timber cuttings with an interval of 15 to 20 years, which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut

yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural seeding. The cuttings are not so large but what the bystanding trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy land and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on

rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches, 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines

and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than 100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to \$0.85).

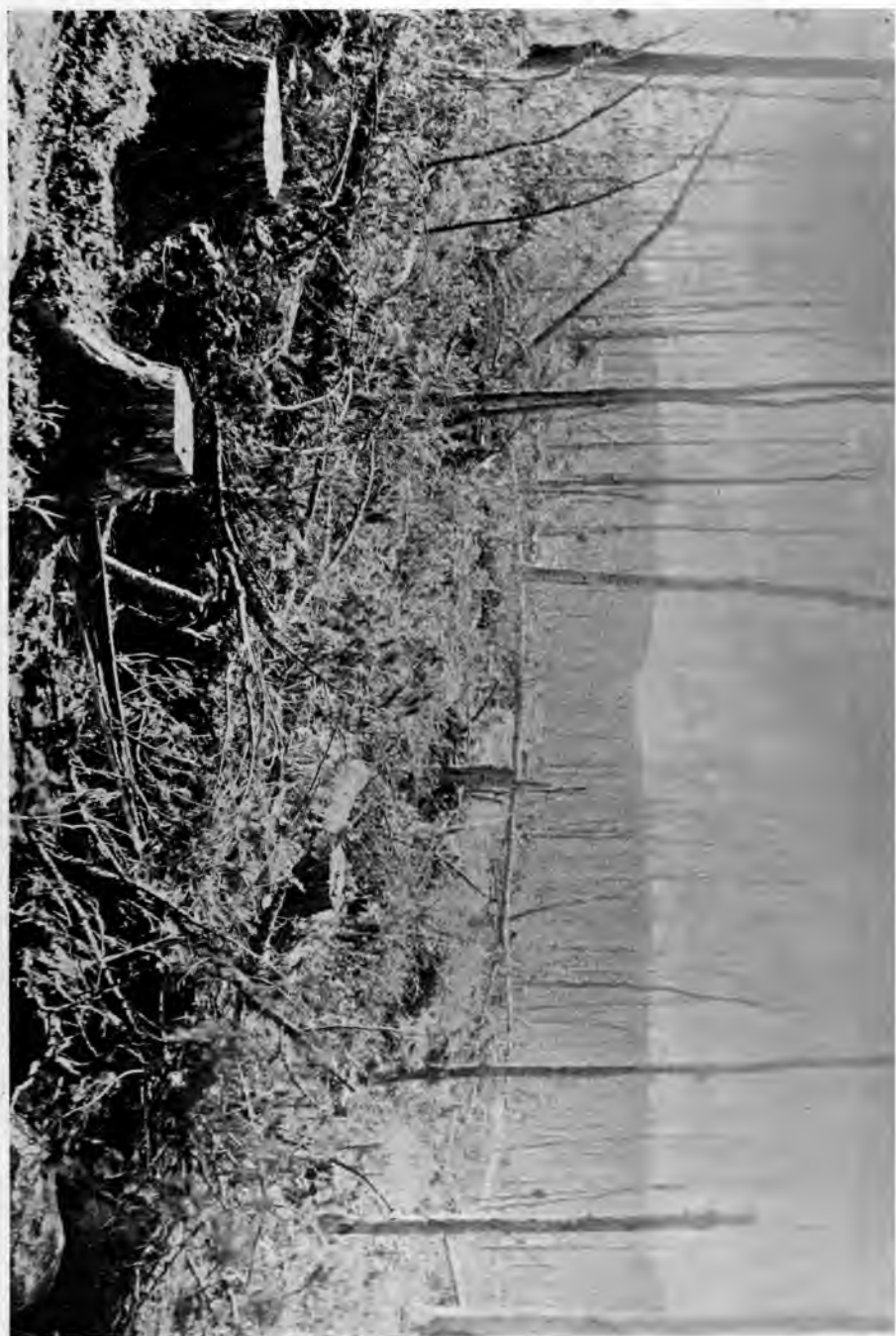
The income from game is not large. There are shot annually 12 elks, many hares and game birds.

ANOTHER SWEDISH FOREST MANAGED AS AN INVIOABLE INCOME YIELDING CAPITAL.

The forest of the Boxholm Company, situated in the province of Ostergotland, in the south central part of Sweden, on the principal railway from Copenhagen to Stock-

holm, and about sixty English miles southwest of the port of Norrköping, is managed on forestry principles; that is, it is managed with a view to a sustained yield, and for that reason a short account of its present situation will be of value. Including pastures, the forest comprises 55,000 acres, the surface is rather hilly, and 20 to 30 per cent of it is rocky; soil sandy and gravelly and for the most part unsuitable for agriculture. In the forest proper three-fourths of the trees are pine and one-fourth spruce; in the pastures birch pine and spruce together or mixed. On an average about 250 to 500 acres are cut over annually; and old forest generally yields 100 to 150 cubic meters per tunnland (one tunnland equals one and twenty-two hundredths of an acre), of which 70 per cent is merchantable timber. Hitherto the forest has been cut in stands having an age of 100 to 150 years or older, together with thinning in younger stands; on the high land the forest is usually cut at the age of 50 to 70 years, although clean cutting seldom occurs. The annual product is about 50,000 logs, 6 inches and upwards in diameter at the top; 20,000 cubic meters of charcoal and all timber required for building, repairs, fencing, etc.

Of the cut-over area on high land perhaps one-third part becomes reforested naturally by self-seeding. Cutting in strips is not practiced, but it is considered preferable to make small clearings, and first in that part of the forest which is more distant from the prevailing winds. To effect reforestation by sowing seed, the ground is first cleared of leaves, twigs and moss by burning, which usually is done in the spring or summer. The following year, or, if the burning takes place in the spring, then the same year if one chooses, the ground is then prepared in pieces a foot square, at proper intervals, and the seed sown in them. The first year the young plants are protected from pasture animals by fencing. About 2,500 pieces a foot square are sown per "tunnland." On grassy places planting occurs instead of sowing. Planting at the Boxholm forest is done



partly with transplants (plants which had previously been taken from the nursery and set in other ground), which are set in holes either with the roots only or with the adhering clumps of earth; partly with seedlings (plants direct from the nursery or first bed), which are set in filled holes with a planting pin. Pine transplants are generally three and spruce four to five years old. When seedlings are used they are, if pine, generally one year old and spruce seedlings two to three years old. The number planted on a "tunnland" varies from 1,500 to 2,500.

The number of timber trees cut on a "tunnland" averages about 100. During even very dry seasons not much is done to prevent forest fires. The forest watchmen perhaps exercise more attention and employ more care, and generally the precautions against forest fires prevent their gaining any great extent. In case any part of the forest is burned, it is, after a couple year's time, resown to forest.

The cutting of timber in this forest has been in progress by the present company twenty-five years, and in previous years it had been operated for timber and charcoal.

There are scores of such forest properties in Sweden.

SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. Under article 24 of the Federal Constitution of May 29, 1894, the Confederation controls only the forests of the high regions, which are about 65 per cent of the total forest area of Switzerland. It is true that since the popular vote of July 11, 1897, which revises the said article 24, the Confederation has from now on the right of inspection of the forest police of the whole of Switzerland.

The federal law of March 24, 1876, which puts into execution the above-named article 24 of the constitution, was promulgated for the forests of the high regions. By the terms of that law the inspection by the Confederation extends over the entire territory of the cantons of Uri, Schwytz, Unterwald, Glaris, Appenzell, Grisons, Tessin and Valais and over the mountainous parts of the cantonal territories of Zurich, Berne, Luzerne, Zoug, Friburg, St. Gall, Jura and Vaud; but the law does not apply to the forests of the plains of the last-mentioned states, nor to the forests of the cantons of Soleure, Bale, Schaffhouse, Argovie, Thurgovie, Neufchatel and Geneva.

The Confederation is not actually the owner of any forests, but a few of the separate states are owners. The forest domains are part of the national wealth, and comprise 91,587 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,403,772 acres. Besides there are private forests, comprising 609,855 acres. The total area of forest is therefore 2,105,220 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in Switzerland. The parts most heavily timbered are the mountain chains of Jura and of the cantons of Schaffhouse, Soleure, Argovie and Neufchatel. Forests are found starting at 200 meters above sea level (in the canton of Tessin) and reach as high as 2,100 meters in the high mountain. In Argovie they even reach 2,300 meters in altitude.

The more common varieties of trees are among the resinous kinds, the opicea, the fir, the larch, the Scotch and mountain pines, the Siberian pine; among the deciduous kinds, the birch and the chestnut tree; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade

in timber and other products of the forest. The value per hectare ($2\frac{1}{2}$ acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1897 the expenses incurred by the Confederation for forest administration amounted to \$56,000.

The following are the net receipts from forests in 1896 as to a few cantons:

Zurich, 180,900 francs, or 91.06 francs per hectare of forest.

Berne, 893,000 francs, or 71 francs per hectare of forest.

Soleure, 33,400 francs, or 44 francs per hectare of forest.

St. Gall, 71,000 francs, or 84.60 francs per hectare of forest.

Argovie, 241,000 francs, or 78.73 francs per hectare of forest.

Vaud, 236,000 francs, or 32 francs per hectare of forest.

The net receipts from town and municipal corporation forests in 1896 were:

Canton of Grisons, 1,200,000 francs, or 10.40 francs per hectare of forest.

Canton of Argovie, 2,378,000 francs, or 70.60 francs per hectare of forest.

On an average about 412 acres of forest have been created annually during the past twenty years, at the expense of the federal treasury.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective. In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-slidings, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforestation by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislations prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds, snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and according to the size of timber that is to be grown, viz., high forest, undergrowth and coppice (*de hautes futaies, de taillis sous futaie ou de taillis simples*), which three modes of management are found in Switzerland.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested except in cases where an equal area of land is converted into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests, and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed for the federal zone in courses lasting two months is attached to this technical personnel, and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among them are Zurich, Berne, Lausanne, St. Gall, Winterhues, Friburg, Coire, Soleure, Schaffhouse.

The Chief Federal Inspector of Forests has an annual salary of 8,000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed; his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall, who has a salary of 5,000 francs, receives ten francs per day and four francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

The following are monthly forestry publications:

Journal Suisse d'Economie forestiere; Der prattische Forsture.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the fortune is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare.

In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines, and which forms a sort of a triangle) lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

STATE FORESTS.

The aggregate extent of the state forests is 418,904 acres, and they extend over the entire kingdom. Fifty-nine per cent of the forests consists of pine, 20 per cent being pitch pine and 9 per cent white pine. The estimated value of the forest land varies from \$29 to \$58 per acre. The annual aggregate expense of administration of the forest amounts to \$1,183,574. Of this \$364,140 is paid to wood-cutters, \$147,560 is expended on roads, \$90,440 in forest culture, \$259,468 for pay of officials, \$148,468 for forest guards. The revenue was \$2,928,352, yielding a net revenue, after for 1895-1896 deducting all expenditures, of \$1,744,788, or \$3.63 per acre. The number of acres annually sown to

forest is 296, and the number of acres planted to forest 6,177.

In regard to reforestation, when the natural seeding of the desired kind of wood occurs in proper time the same is used; otherwise planting or artificial growing takes place. Natural sowing is estimated at about 25 per cent; artificial renewing amounts to about 75 per cent. The latter is almost exclusively done by planting, whereas sowing in free woodland is very seldom applied. It is a principle to maintain (as far as the division of the age of the plantings permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic meters per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age. If the natural seed falling is intended to be used, the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings. Moreover, the state buys every year about 400 acres of woodland to increase and round off the forests.

The amount of damage annually caused by forest fires is only \$642.60, and the principal cause of such fires is carelessness and negligence while smoking and lighting fires in or near the forests. In the last ten years out of 120 forest fires only 8 were caused by sparks from locomotives, and of these only one caused considerable damage (about \$3,570).

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said

that the forest officials rank in general equally with those state officials who are graduates of the university. The Department of Forests is directed by one president, four technical and four administrative members and one commander of the forest guards. The salary of the president is \$1,844.50 per year; the salary of the members of the Board of Direction is from \$1,190 to \$1,618. A work entitled "The Forests of Wurtemberg," published by Rueger Stuttgart, 1880, gives a fair review of the situation of the forestry of the country. It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and forest culture in general.

PRIVATE FORESTS.

The aggregate extent of private forests is 528,794 acres, of which 210,000 acres are administered by technical forest officials; the remainder is also administered in a proper manner. As the permission of the government is required for cutting and replanting of forest lands, and this permission is only given under the condition that an equal area to what has been cut shall be planted, the aggregate area of forest land remains the same throughout the whole country; but portions of it are gradually coming into the possession of the state government.

THE PROGRESS OF FORESTRY IN THIS COUNTRY.

The past year has witnessed the triumph of the policy of permanent forest reserves. The United States government has set apart 46,000,000 acres of mountain lands as such reserves and has appointed superintendents and rangers to assist in their administration, and their protection from fire. They are being surveyed under charge of the Director of the Geological Surveys. For the first time in the history of our country, the President, in his (last)



Primeval Norway and young white pine given to the State University by the United States and situated on the north shore of Vermillion Lake. Photographed, 1898, for the Annual Report of the Chief Fire Warden of Minnesota.

annual message, devoted space to forestry and the need of precautions against forest fires.

The Minnesota State Forestry Board was organized June 26, 1899, by the election of Judson N. Cross, of Minneapolis, as president; Greenleaf Clark, of St. Paul, vice president, and C. C. Andrews, of St. Paul, secretary. The board is composed of the following nine members: C. C. Andrews, Chief Fire Warden, and Samuel B. Green, Horticulturist in the State University, ex-officio members; John Cooper, of St. Cloud; Frederick Weyerhaeuser, of St. Paul, and O. M. Lord, of Minnesota City, recommended by the regents of the State University, and to hold for four years; Judson N. Cross, of Minneapolis, recommended by the State Forestry Association; Greenleaf Clark, of St. Paul, recommended by the State Agricultural Society; William Mitchell, of Winona, recommended by the Game and Fish Commission; and A. L. Cole, of Motley. Charles A. Duncan, of Duluth, was recommended by the State Horticultural Society, but, as he declined, the governor appointed Mr. Cole.

The legislature of Michigan, at its last session, passed an important act creating a forestry commission of three members, charged with a thorough inquiry into the forest resources of the state, the injury being done by forest fires, etc., and to report by bill or bills to the legislature which will meet in 1901. On its recommendation the state land office is to withdraw from sale two hundred thousand acres of land belonging to the state. The commission is authorized to receive, by deed to the state, from the owners, any tracts of land which, in its judgment, may be suitable as forest reserves.

The Chief of the Division of Forestry, Washington, D. C., last year issued a circular offering to furnish forest working plans on certain conditions to private individuals. Many are availing of this offer. Mr. Reed, of Anoka, a lumber-

man, is having 1,000 acres treated on this plan. Over 100,000 acres of spruce forest in the Adirondacks, properties of Dr. W. Seward Webb, Hon. William C. Whitney and Mr. Patrick Moynehan, are being operated on plans furnished by the Division of Forestry.

A few owners of extensive forest tracts are employing foresters to assist in their operations with a view partly to conserve their timber resources. For example, the Berlin Mills Company, of New Hampshire, owning some 300,000 acres of spruce land, and who manufacture lumber, pulp and news paper, employ Mr. Austin Cary as a forester, who has examined large portions of their holdings, studying the amount and condition of the timber. A main part of his work is also the construction of topographical maps, which facilitate planning and controlling logging work. The cut which is now yearly being made by that company, if kept up, will exhaust the timber in a few decades. However, the owners believe that in some places conservation cutting will pay, because it will provide a second crop, yielding more stumpage. Mr. Cary has been present during the cutting season, seeing that the work went on economically. The International Paper Company, of Berlin, New Hampshire, owns or controls about 1,000,000 acres of spruce timber land, situated mostly in Maine, Vermont, New Hampshire and New York, and employs Mr. E. M. Griffith as forester. He has made working plans for 123,000 acres in New Hampshire and Maine which will limit the cutting of spruce to 14 inches on the stump. The fir (*Abies balsamea*) will be cut to 5 inches, as it is their wish to regenerate to spruce. They expect to cut on a rotation of 25 years, and to have standing timber tributary to each mill of sufficient size and stand of spruce to furnish the supply of logs and peeled wood indefinitely. The company applied to the Division of Forestry for detailed working plans for 500,000 acres, and Mr. Griffith, who is furloughed from the Division of Forestry, is assisting in the work. Mr. Griffith, after

studying subjects associated with forestry in Yale University, pursued the study and practice of forestry in Germany, and, after returning to this country, studied and worked under Dr. C. A. Schenck, superintendent of Mr. George W. Vanderbilt's forests at Biltmore, N. C. Mr. George T. Crawford, of Boston, is a well-known practical forester, who has had many years' experience, and is extensively employed in making estimates and reports on timber properties in New England and Canada. Certainly there is increasing tendency to regard the intimate and friendly relations which ought to exist between forestry and lumbering.

"Forestry in Minnesota," an illustrated hand-book of 312 pages, by Professor Samuel B. Green, published by the Minnesota Forestry Association and distributed by its secretary, Mr. George W. Strand, of Taylor's Falls, Minn.; "The Adirondack Spruce," an illustrated hand-book of 157 pages, by Mr. Gifford Pnichot, chief of the Division of Forestry; and the report of the Forestry Commission of Wisconsin, were particularly valuable contributions to American forestry literature the past year.

DESTRUCTION OF SCENERY.

The public cannot too deeply be impressed of the importance of preventing forest fires, if only for the preservation of our scenery. How they wipe out property—how dreadful they are to women and children whose humble homes are in woodland regions—most people can imagine. But it needs one to open his eyes upon the miles and miles and scores of miles of blackened and dead forests that have been killed by fire along our railroads to comprehend what it is to destroy scenery. A living forest bordering a railway is beautiful. Turned into a dismal waste of tree skeletons by fire, it is horrible, and remains for years an advertisement to all travelers of criminal carelessness and semi-

civilization. Such scenery we might expect to see in the heart of Africa, but not in a country like ours, which feels itself to be glorious; and that man who is indifferent to using some means for preventing forest fires is either indifferent to the welfare of his state or has not duly considered the subject.

Respectfully submitted,

C. C. ANDREWS,
Chief Fire Warden.

